
CXPS Manual



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WELCOME

1

ABOUT THIS MANUAL

This manual contains information about the CXPS digital video matrix switcher and video processor. Material is presented under the following sections:

Section	Chapters	Description
Introduction	Chapter 1, "Welcome." Chapter 2, "Product Information."	Use this section to get to know this product manual, understand key safety measures, and learn about the key features and functionality of the CXPS.
Configuration	Chapter 3, "Configuration Options."	Use this section to understand your product configuration options before you purchase, as well as learn about the video signal handling and remote control capabilities. The CXPS is a highly-configurable device and this section details the available product options for video input and output, and for CPU board and USB ports.
Installation	Chapter 4, "Getting Ready to Install." Chapter 5, "Installation Instructions."	Use this section to learn about installing the CXPS. Included in this section are both an overview of the installation process, and detailed, step-by-step installation instructions.
Operation	Chapter 6, "About the Web-Server GUI." Chapter 7, "Matrix Switching." Chapter 8, "Video Scaling." Chapter 9, "Video Windowing." Chapter 10, "Dissolve and Force Effects." Chapter 11, "Wall Processing."	Use this section to learn about the digital video processing capabilities of the CXPS. Get an introduction to the web-server GUI and detailed instructions on how to use the matrix switching, video scaling, video windowing, dissolve and force, and wall processing features.
Reference	Appendix A, "RS-232 and 10/100T Protocol." Appendix B, "Upgrading Firmware."	Use this section to refer to detailed remote control command set information, RS-232 pinout information, and firmware upgrade information and instructions.

SAFETY INFORMATION AND INSTRUCTIONS

The following safety instructions are to ensure the safety of personnel using this equipment and to protect this device and working environment from potential damage.

CAUTION!



- 1 ELECTRIC SHOCK HAZARD. DO NOT OPEN.**
- 2 REMOVAL OF COVER MAY RESULT IN ELECTRIC SHOCK. There are no user-serviceable parts inside. Contact Black Diamond Video for authorized repair service.**



WELCOME

Customer Service and Support

IMPORTANT SAFETY INFORMATION:

- Read and follow all instructions – Read all safety and operating instructions before operating this equipment. Follow all operating instructions in this manual and adhere to all warnings on the equipment and in this manual.
- Keep all documentation – Retain the User’s Manual and accompanying safety instructions for future reference.
- Maintain proper ventilation – This equipment should be maintained in a well-ventilated room with adequate air flow. Do not obstruct the ventilation slots on the device.
- Keep away from heat – Do not place this device near a heat source. Failure to comply could result in overheating and damage to the equipment.
- Keep away from water and moisture – Do not place this equipment near areas of running water or dense condensation.
- Cleaning – Unplug the device before cleaning. The device can then be wiped with a water-dampened soft cloth.
- Proper electrical grounding – This device must be plugged into a properly grounded outlet in order to avoid electric shock. Do not bypass the grounding features of the power cable or plug. When using an extension cord, make sure the cord is designed for grounded plugs.

CUSTOMER SERVICE AND SUPPORT

For technical support and service, contact Black Diamond Video at:

Black Diamond Video

503 Canal Blvd.

Richmond, CA 94804

Phone: (510) 439-4500

Fax: (510) 439-4599

Visit us on the web at www.blackdiamondvideo.com.

PRODUCT INFORMATION

INTRODUCING THE CXPS

The CXPS is an all-digital DVI processor that integrates seamless 36 x 36 DVI matrix switching, post-output scaling, and video windowing into a single unit. When combined with Black Diamond Video's DVI converters, the CXPS provides the same level of switching, scaling, and windowing for any analog, SDI, or HD-SDI signal source eliminating the need for multi-format switches and cables.

The CXPS supports DVI operation at the maximum TMDS rate of 1.65 Gb/s. The CXPS works seamlessly with Black Diamond Video's DVI X-treme Cable Kits, allowing the transmission of DVI signals over 60 meters of copper on both the input and output sides of the processor.

The CXPS system diagram (*Figure 1*) illustrates the full functionality of this DVI processor when combined with Black Diamond Video's DVI Converters and DVI X-treme Cable Kits.

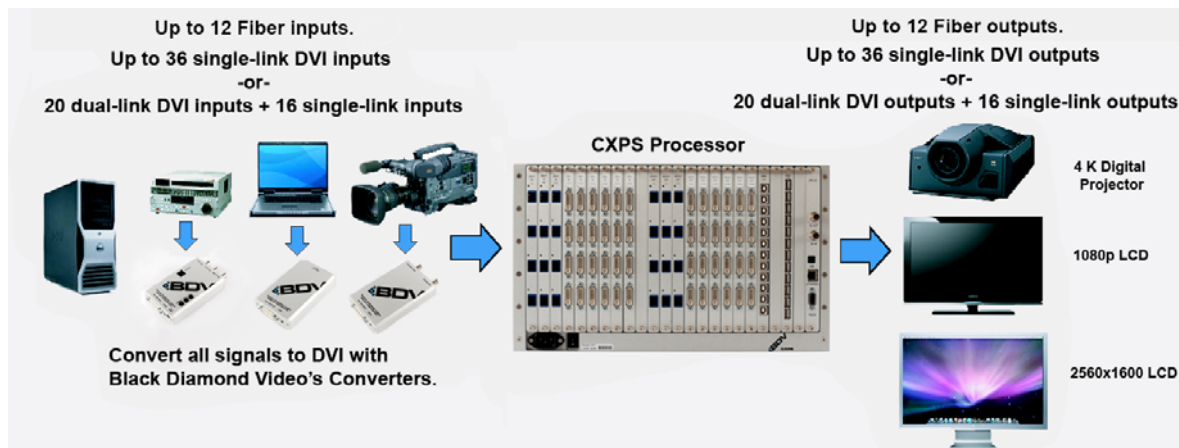


FIGURE 1. CXPS System Diagram

PRODUCT INFORMATION

Key Features

KEY FEATURES

Features include the following:

SWITCHING

- Seamless, non-blocking 36 x 36 DVI matrix switching.
- Supports dual-link DVI matrix switching at the maximum TMDS rate of 2 x 1.65 Gb/s.
- Supports single-link DVI matrix switching at the maximum TMDS rate of 1.65 Gb/s.
- Input and output rates from 640 x 480 up to 3840 x 2400, interlaced or progressive.

IMAGE PROCESSING - VIDEO SCALING

- Output slots 1, 3, 5, 7 and 9 can be populated with one Quad Dual Link Scaler (QDLSC) video processing card, for up to five cards.
- Auto-resolution display so that any video input will be displayed at its maximum resolution and proper aspect ratio on any video monitor.
- Image controls include pan, zoom, position, contrast, brightness, and programmable LUTS.
- Frame latency < 1.5 frames.

IMAGE PROCESSING - WINDOWING

- Each QDLSC video processing card can be equipped with video windowing functionality.
- Windows can be arbitrarily sized, positioned, and prioritized smoothly, in real time.
- Transitional effects supported: alpha blending, wipe, and chroma keying.
- Chroma keying supported across multiple windows.
- QDLSC windowing cards can be used for a maximum of 36 windows, 4 windows per card.

PHANTOM-POWER AND CONVERTER CONTROLS

- Phantom-power to Black Diamond Video's DVI X-treme Cable Kits.
- Phantom-power and control for Black Diamond Video's DVI Converters.

CONTROLS

- RS-232 serial
- 10/100T Ethernet

GENERAL

- 6U high, rack mountable
- Remote diagnostic capability

FRONT PANEL DETAIL

Figure 2 details the CXPS front panel.



FIGURE 2. CXPS Front Panel

PRODUCT INFORMATION

Rear Panel Detail

REAR PANEL DETAIL

Figure 3 details a fully-equipped CXPS. Your device may be configured with fewer connections.

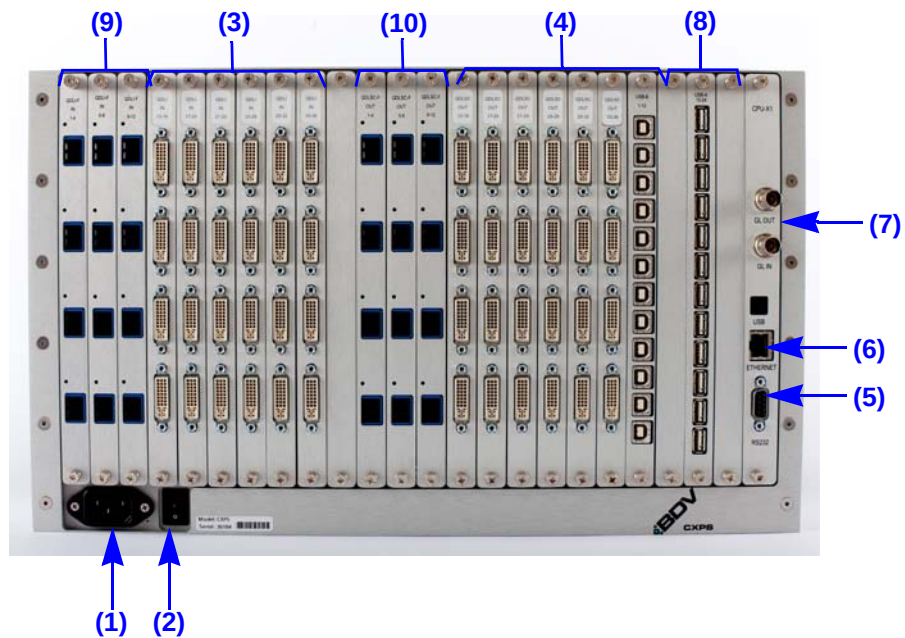


FIGURE 3. CXPS Rear Panel Diagram

1 - AC POWER IN

AC input power connection (120/240 VAC).

2 - POWER SWITCH ON/OFF

The power switch is used to turn the unit on or off. The system status light on the front panel indicates when the unit is powered on.

3 - DVI-I INPUT CONNECTIONS

The DVI-I input connectors are used to connect a video source to the CXPS. If the input source is a DVI source, it can be connected directly to the device. If the input source is an analog or SDI source, the signal must first be converted to DVI using a Black Diamond Video DVI converter before connecting it to the CXPS.

On a fully-configured CXPS, Dual-Link DVI is supported on the following input connectors: 1-4, 9-12, 17-20, 25-28, 33-36. Single-Link DVI is supported on all input connectors.

For cable distances greater than seven meters, Black Diamond Video certified DVI cable should be used. Black Diamond Video certified DVI cable is factory tested and guaranteed for distances up to 60 meters. A DVI X-treme conditioner is not required on the input side of the CXPS.

4 - DVI-O OUTPUT CONNECTIONS

The DVI-O output connectors are digital DVI outputs used to connect to a digital display device. On a fully-configured CXPS, Dual-Link DVI is supported on the following output connectors: 1-4, 9-12, 17-20, 25-28, 33-36. Single-Link DVI is supported on all output connectors.

When connecting to a display device more than seven meters from the CXPS, a DVI X-treme Cable Kit should be used with the DVI X-treme conditioner placed on the display side of the cable.

5 - RS-232 SERIAL INTERFACE

The RS-232 interface is a DCE type used to control the CXPS by an external host over a serial port or alternate RS-232 controller. A direct connect type RS-232 cable should be used to connect the CXPS to a PC.

6 - 10/100T ETHERNET PORT

The 10/100T Ethernet port is used for controlling the CXPS from a remote location. This port is also used for firmware upgrades in the field. The 10/100T Ethernet port can control the CXPS through commands similar to the RS-232 port.

7 - GENLOCK INPUT/OUTPUT

The genlock I/O is used as an alternative external genlock source for the output scaler and windowing cards. It is a general purpose +3.3V or +5V level genlock source.

8 - USB MATRIX SLOTS

Each USB matrix slot can accept a USB type B (input) or type A (output) card. Each card supports 12 USB connectors.

9 - FIBER-I INPUT CONNECTIONS

The Fiber-I input connectors are used to connect a fiber video source to the CXPS.

10 - FIBER-O OUTPUT CONNECTIONS

The Fiber-O output connectors are fiber outputs used to connect to a fiber display device.

PRODUCT INFORMATION

Options

OPTIONS

The following external options are available for the CXPS:

- **DVI X-treme Cable and Cable Kits** are phantom-powered and allow DVI signals to be transmitted up to 60 meters on both the input and output sides of the switch for a cumulative distance of 120 meters. Output cable kits are available in both single-link and dual-link DVI format. These kits contain output cable and a DVI signal conditioner and are used when the distance between the CXPS and the display device exceeds seven meters. The dual-link DVI signal conditioner can accept both single-link and dual-link DVI signals. The single-link DVI signal conditioner can only accept single-link DVI.
- **Fiber Cable** is required for use over distances exceeding 60 meters. Fiber optic cable can be used in conjunction with DVI-Fiber and Fiber-DVI converters.
- **SD-DVI Converter** converts any standard-definition analog signal (NTSC, PAL) to DVI. This converter is phantom-powered and is controlled and integrates seamlessly with the CXPS.
- **RGB-DVI Converter** converts any analog RGB signal to DVI. This converter is phantom-powered and is controlled and integrates seamlessly with the CXPS.
- **SDI-DVI Converter** converts any SDI or HD-SDI source to DVI. This converter is phantom-powered and is controlled and integrates seamlessly with the CXPS.
- **Fiber-DVI Converter** converts any fiber source to DVI. This converter is phantom-powered and is controlled and integrates seamlessly with the CXPS.
- **DVI-Fiber Converter** converts any DVI source to fiber. This converter is phantom-powered and is controlled and integrates seamlessly with the CXPS.

NOTE: For information about configuration options for the CXPS, see Chapter 3, "Configuration Options."

PRODUCT SPECIFICATIONS

VIDEO SPECIFICATIONS

- Video Formats:
 - DVI Single-link, supports maximum TMDS rate of 1.65 Gb/s.
 - DVI Dual-link, supports maximum TMDS rate of 2 x 1.65 Gb/s.
- Video Resolution:

PRODUCT INFORMATION

Product Specifications

Single-link DVI I/O rates 640x480 to 1920x1200, interlaced or progressive, 25-165 MHz.

Dual-link DVI, 165 - 333 MHz, I/O rates including: 3840 x 2400 33 Hz; 2560 x 1600 60 Hz; 2048 x 2160 60 Hz; 2048 x 1536 75 Hz; 2048 x 1080 120 Hz; 1920 x 1080 85 Hz.

- Connectors: DVI-I female.

CONTROLS

- Serial Controls: RS-232 controls, DB9 female connector.
- Ethernet Controls: 10/100T Ethernet control, Protocols: Telnet, FTP.

GENERAL

- Dimensions/Weight: 6U, rack-mountable enclosure, 19.0"W x 14.6"D x 10.5"H, 43 pounds.
- Temperature Rating: 0-55° C.
- Power: 90-240 VAC, 47-63Hz, 1500 Watts, fully-loaded.



PRODUCT INFORMATION

Product Specifications

CONFIGURATION OPTIONS

This chapter details the configuration options for the CXPS. The CXPS can be configured for the following elements:

- Video Input...**
 - Number of input channels and type (DVI or fiber)
- Video Output...**
 - Number of output channels and type (DVI or fiber)
 - Video scaler output cards
 - Video windowing output option
- USB...**
 - Number of Type B input channels
 - Number of Type A output channels

Figure 4 shows the back panel card and connector layout of the CXPS.



FIGURE 4. CXPS Back Panel Board and Connector Layout

VIDEO OPTIONS

Your CXPS can be configured with input and output cards for up to 36 x 36 channels, as shown in Figure 4. Both input and output cards contain four connectors each so your CXPS can have any combination of inputs and outputs where each channel type is a multiple of four, up to nine input cards and nine output cards.

CONFIGURATION OPTIONS

Video Options

For example, your system could be configured as 4 x 4 (1 input card, 1 output card), 8 x 4 (2 input cards, 1 output card), 8 x 8 (2 input cards, 2 output cards), 12 x 4 (3 input cards, 1 output card), 12 x 8 (3 input cards, 2 output cards), 12 x 12 (3 input cards, 3 output cards), and so on.

Input and output cards are capable of supporting either single-link or dual-link DVI signals. However, there are limitations to consider regarding dual-link inputs and outputs. These limitations are discussed in “Dual-Link vs Single-Link”.

DUAL-LINK VS SINGLE-LINK

Dual-link DVI is only supported on odd-numbered slots. This applies to both input and output channels. This means that on a fully-configured system with nine input cards and nine output cards, the maximum number of dual-link DVI channels is 20 x 20. The input and output channels on the cards in odd-numbered cards 1,3,5,7, and 9 would be dual-link DVI-capable.

IMPORTANT!	Dual-link DVI is only supported on odd-numbered cards. This applies to both input and output channels.
-------------------	--

All input and output slots support single-link DVI. This means that the CXPS supports the full 36 x 36 matrix for single-link DVI channels.

For example, let's say you have a 16 x 8 system. Your CXPS would have four input cards and two output cards (Remember, there are four channels per card). You could apply dual-link DVI signals to the input channels in the cards in slots one and three, and you could display those signals through the output channels on the card in slot one. Your total system is 16 x 8 and it supports 8 x 4 dual-link DVI channels.

USING DVI AND FIBER CONVERTERS

The CXPS accepts DVI and fiber video inputs only. Black Diamond Video offers a line of single-link DVI and Fiber converters which you can use to convert your Fiber, RGB, HD, and SDI video signals to single-link DVI, or your DVI signals to Fiber. With the appropriate converter, you can use any of these video formats as a source for the CXPS.

VIDEO INPUT OPTIONS

The CXPS can be configured with up to nine video input cards. Each card has four input channels. By design, the video input card can accept either dual-link or single-link DVI, or single-link fiber. However, the CXPS only supports dual-link DVI on cards installed in odd-numbered slots (as discussed in the previous section, “Dual-Link vs Single-Link”).

The input channels are numbered from left to right and top to bottom, so the card in slot number one (the farthest left as you look at the back panel) contains input channel numbers

1, 2, 3, and 4, counting from the top of the card to the bottom. The card in slot number two contains input channel numbers 5, 6, 7, and 8, and so on up to 36.

VIDEO OUTPUT OPTIONS

The CXPS can be configured with up to nine video output cards. Each card has four output channels. By design, the video output card can accept either dual-link or single-link DVI. However, the CXPS only supports dual-link DVI on cards installed in odd-numbered slots (as discussed in “Dual-Link vs Single-Link” above).

Like the input channels, output channels are numbered from left to right and top to bottom, so the card in output slot number one (the one immediately to the right of the switch fabric card as you look at the back panel) contains output channel numbers 1, 2, 3, and 4, counting from the top of the card to the bottom. The card in slot number two contains input channel numbers 5, 6, 7, and 8, and so on up to 36.

Currently, there are four video output card options. All four options come with four output channels. New options are under development; contact Black Diamond Video for more information.

Video Output Board	Description
Repeater	Standard DVI output (no processing). Used for standard switching operation only where the output exactly matches the input signal. For more information on the operation of the repeater card, see Chapter 7, “Matrix Switching.”
Quad Single Link Scaler (QSLs)	Video scaler single-link DVI output. Used for scaling the input image up or down, and also offers pan and zoom functionality. For more information on the operation of the QSLs card, see Chapter 8, “Video Scaling.”
Quad Dual Link Scaler (QDLS)	Video scaler dual-link DVI output. Used for scaling the input image up or down, and also offers pan and zoom functionality. For more information on the operation of the QDLS card, see Chapter 8, “Video Scaling.”
Fiber Output Card	Single-link scaler card with fiber outputs. Used for scaling the input image up or down, and also offers pan and zoom functionality. For more information on the operation of the Fiber Output Board, see Chapter 8, “Video Scaling.”



CONFIGURATION OPTIONS

USB Options

USB OPTIONS

The CXPS has four USB slots (*Figure 5*). Each slot can accept a USB type B (input) or type A (output) card. Each card supports 12 USB connectors. Your CXPS can be configured with any combination of type B and type A USB cards, as long as there is at least one of each type.

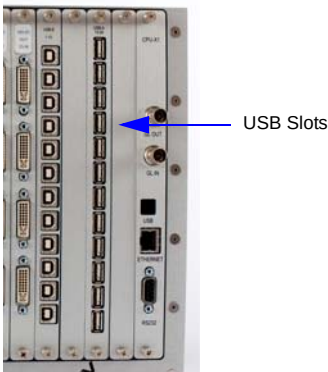


FIGURE 5. CXPS USB Slots

The supported USB configurations are:

USB Type B — Input from PC		USB Type A — Output to PC	
# Boards	# Channels	# Boards	# Channels
2	24	1	12
2	24	2	24
1	12	2	24
1	12	1	12

GETTING READY TO INSTALL

This chapter presents an overview of the installation process. Read this chapter to get an introduction to how to install the CXPS. Included is information about using DVI converters (required if you have video sources that are not in DVI format) and Black Diamond cable kits.

For detailed installation instructions see Chapter 5, “Installation Instructions.”

OVERVIEW OF THE INSTALLATION PROCESS

Installing the CXPS can be divided into two phases:

System Test Installation. Begin your installation process by performing a complete system test installation. The purpose of this phase is to establish remote control of the CXPS, and verify that all input and output channels are working. You will use a single test video input and at least one of the display devices you plan to use in your final system installation. You will verify that your test video input is properly displayed on the display device when routed through each input and output channel.

Final System Installation. Complete the installation process by doing the final system installation. In this phase, you will install the CXPS in its final location. You will establish permanent remote control, connect all necessary input and output cabling, apply all input sources (including any DVI converters as necessary), and connect all display devices. Finally, you will verify that each video source is properly displayed on each display device.

SYSTEM TEST INSTALLATION OVERVIEW

The system test installation should be performed first to verify your equipment is working properly. It will also help you begin to plan for and organize the video sources, cabling equipment, and display devices in preparation for the final system installation.

NOTE: This is an overview of the system test installation to help inform and prepare you for the actual installation process. For detailed installation instructions, see Chapter 5, “Installation Instructions.”

GETTING READY TO INSTALL

System Test Installation Overview

The system test installation consists of four steps. These steps are described below and illustrated in *Figure 6*.

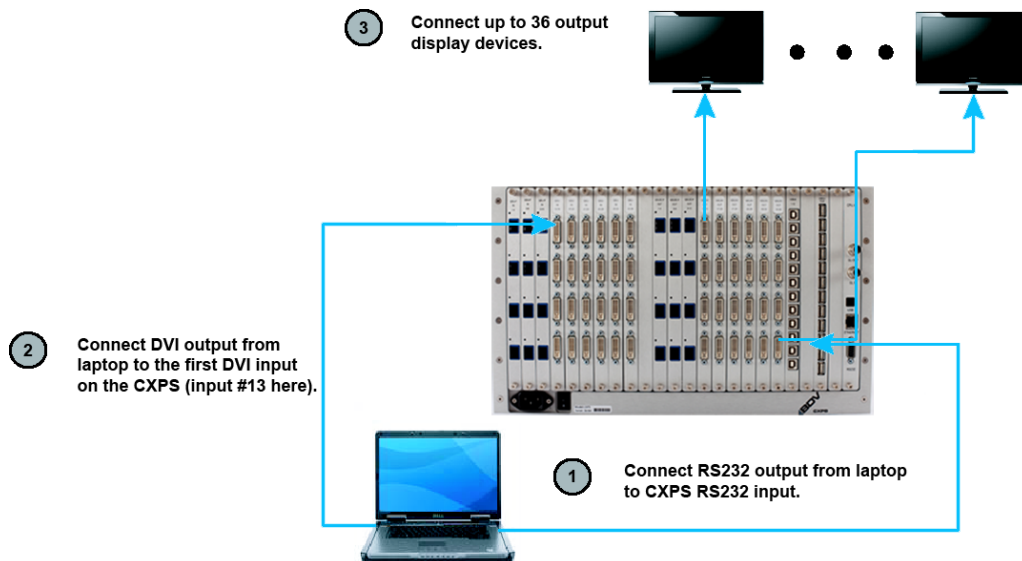


FIGURE 6. CXPS System Test Installation Diagram

Step 1. Establish Temporary Remote Control of the CXPS

Establish temporary remote control of the CXPS through a laptop computer or personal computer using the RS-232 serial interface. This allows control of the CXPS so that the video signals going into and out of the processor can be tested.

Step 2. Connect Test DVI and Test Fiber Input Sources

Connect one fiber video source to the first fiber input on the CXPS (if applicable). Connect one DVI video source to the first DVI input on the CXPS. In *Figure 6*, the first fiber input is input 1 and the first DVI input is input 13. Only a single DVI source and single fiber source are required for the system test installation phase. Use Black Diamond Video tested DVI and fiber cable to connect your test sources to the CXPS.

NOTE: If the computer you used in Step 1 has a DVI output, you can use it for the test DVI video source in this step. This computer should have a built-in DVI graphics card.

Step 3. Connect one or more Display Devices and Establish Video Output

Connect a fiber display device to the first fiber output on the CXPS. Connect additional display devices as desired. Using the test fiber input connected in *Step 2*, use serial commands to switch the input to each connected fiber display device. Verify that all video displays or output devices (such as DVD recorders, etc) are functioning correctly.

Next, connect a DVI display device to the first DVI output on the CXPS. Connect additional display devices as desired. Using the test DVI input connected in *Step 2*, use serial commands to switch the input to each connected fiber display device. Verify that all video displays or output devices (such as DVD recorders, etc) are functioning correctly.

Step 4. Test all Remaining Input Channels

Verify that all remaining input channels are functioning properly. Using the test fiber and DVI video sources, connect to each input channel on your CXPS and then route the signal to each connected display device.

FINAL SYSTEM INSTALLATION OVERVIEW

The final system installation should be performed after you have completed the system test installation. You should have all of your video sources, cabling equipment, and display devices assembled in preparation for the final system installation.

NOTE: This is an overview of system installation to help inform and prepare you for the actual installation process. For detailed installation instructions, see Chapter 5, "Installation Instructions."

The final system installation consists of four steps. These steps are described below.

Step 1. Place the CXPS into the Rackmount or Other Permanent Location

The CXPS can be installed in a 6U rackmount. Place your unit in its permanent location before making any other system connections. Be sure to follow the safety warnings regarding proper ventilation of the equipment.

IMPORTANT!	A 1U air gap must be allowed for above and below the CXPS for proper air flow and cooling. Failure to do so may result in excessive heating and poor system performance.
-------------------	--

Step 2. Connect all Video Inputs

Connect all fiber and DVI sources directly to the CXPS input channels. All non-DVI, non-fiber sources must first be converted to DVI using a Black Diamond Video DVI Converter. See "Using DVI Converters" on page 18 for more information.

GETTING READY TO INSTALL

Using DVI Converters

All cabling from the DVI Converters to the CXPS should use Black Diamond Video tested DVI cable. Black Diamond Video can not guarantee the quality of cable purchased from other manufacturers. See “Using Black Diamond Cable and Cable Kits” on page 18 for more information.

Step 3. Connect all Display and Output Devices

Connect all display and output devices to the CXPS output channels. All cabling from the CXPS to the display devices should use Black Diamond Video tested DVI or fiber cable. Black Diamond Video can not guarantee the quality of cable purchased from other manufacturers. See “Using Black Diamond Cable and Cable Kits” on page 18 for more information.

Step 4. Establish Permanent Remote Control

Establish permanent remote control to the CXPS using RS-232, 10/100T Ethernet control, or the web-server GUI.

Step 5. Test all Input/Output Switching Configurations

Route each input to each output in turn and verify the video displays properly on the display device. If video output option cards are installed, test the video processing functions of these cards.

USING DVI CONVERTERS

The CXPS accepts DVI and fiber video inputs only. Black Diamond Video offers a line of single-link DVI and Fiber converters which you can use to convert your Fiber, RGB, HD, and SDI video signals to single-link DVI, or your DVI signals to Fiber. With the appropriate converter, you can use any of these video formats as a source for the CXPS.

The converter should be located as close to the video source as possible to eliminate cabling problems such as attenuation and noise. See “Options” on page 8 for more information about the available DVI converters.

USING BLACK DIAMOND CABLE AND CABLE KITS

When using Black Diamond Video DVI cable kits, signal conditioners should be applied within the last three meters of copper DVI cabling before each display device. Black Diamond Video offers both single-link DVI and a dual-link DVI cable kits which include Black Diamond Video tested DVI copper cable and a signal conditioner.

GETTING READY TO INSTALL
Using Black Diamond Cable and Cable Kits



Black Diamond Video's Fiber Optic cable should be used for distances over 60 meters.
See "Options" on page 8 for more information about cable and cable kit options.



GETTING READY TO INSTALL

Using Black Diamond Cable and Cable Kits

INSTALLATION INSTRUCTIONS

This chapter tells you how to install your CXPS system. You should read Chapter 4 “Getting Ready to Install” first to familiarize yourself with the installation process.

The installation of your CXPS should be conducted in two phases:

System Test Installation. Begin your installation process by performing a complete system test installation. The purpose of this phase is to establish remote control of the CXPS, and verify that all inputs and outputs are working. You will use a single test video input and one of the display devices you plan to use in your final system installation. You will verify that your test video input is properly displayed on the display device when routed through each of the input and output channels.

Final System Installation. Complete the installation process by doing the final system installation. In this phase, you will install the CXPS in its final location. You will connect all necessary input and output cabling, apply all input sources (including any DVI converters as necessary), connect all display devices, and establish permanent remote control.

SYSTEM TEST INSTALLATION

Complete a thorough test of your CXPS equipment before doing the final system installation. The system test installation consists of the following series of steps:

Step 1: AC Power Connection and System Power Up

WHAT YOU WILL NEED FOR THIS STEP

- Power cord (supplied)
- Surge protector (recommended)
- Line conditioner (recommended)

DESCRIPTION

Begin your system test installation by connecting the CXPS to an AC power supply and powering it up.

- 1 Connect the power cord (supplied) to the AC input on the CXPS.**
- 2 Plug the power cord into a surge protector (recommended).**
- 3 Plug the surge protector into a conditioned AC power source.**

INSTALLATION INSTRUCTIONS

System Test Installation

4 Turn on the CXPS using the power switch on the rear panel.

The status button on the front panel turns blue or green when the CXPS CPU is initialized and ready.

Step 2: Establish Test Remote Control

WHAT YOU WILL NEED FOR THIS STEP

- Laptop or personal computer with a serial port
- RS-232 direct-connect type serial cable with DB9 (male) connector

DESCRIPTION

The CXPS can be controlled over either an RS-232 or a 10/100T Ethernet connection. For initial testing of this equipment, Black Diamond Video recommends temporary control of the CXPS with a laptop computer using a RS-232 terminal program. Using the RS-232 interface and command set allows for the easy set-up and rapid ability to debug any installation problems.

1 Connect a laptop or PC to the CXPS RS-232 serial interface using a direct-connect type cable.

2 Open up a serial port terminal on the laptop or PC connected to the CXPS. For Microsoft Windows-based programs access this with Start > All Programs > Accessories > Communications > Hyperterminal.

The New Connection window appears.

3 Enter a name for your connection and choose an icon.

4 Click OK.

The Connect To window appears.

5 In the Connect using field, select COM port to which you have connected the CXPS.

6 Click OK.

The Port Settings window appears.

7 Configure the settings as follows:

- Baud: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

8 Click Apply.

The RS-232 connection to the CXPS is established and the processor can be controlled using the RS-232 command set found in Appendix A, "RS-232 and 10/100T Protocol."

Step 3: Connect and Test a DVI and a Fiber Input on all Output Channels

WHAT YOU WILL NEED FOR THIS STEP

- DVI video input source. Black Diamond Video recommends that, for this DVI input source, you use the same laptop or personal computer that is being used to temporarily control the CXPS.
- Display device capable of displaying a DVI video input signal.
- DVI cable.
- (Optional) DVI signal conditioners. If the distance to the display requires more than seven meters of DVI cable, a Black Diamond Video DVI X-treme Cable Kit should be used with the DVI X-treme II Conditioner and appropriate length of cable provided in the DVI cable kit.
- Fiber video input source (if the CXPS has fiber inputs).
- Display device capable of displaying a fiber video input signal (if the CXPS has fiber outputs).
- Fiber optic cable.
- RS-232 Commands:

SW	<input>	<output>
----	---------	----------

DESCRIPTION

For the system test installation, apply a single DVI test video input signal and a single fiber test video input signal. Connect at least one of the display devices you plan to use in your final system installation. Verify that your test video input is properly displayed on the display device when routed through each input and output channel. The easiest method to ensure transmission is to connect a reliable video source directly to the CXPS input.

1 Connect a DVI (or fiber) source to the first DVI (or fiber) input of the CXPS.

This should be done using Black Diamond Video tested cable. Black Diamond Video recommends that you use the same laptop that is being used to temporarily control the CXPS simultaneously as the DVI source. A fiber source should be used to test fiber cable.

2 Make certain that the display(s) being tested has been set to display a DVI digital signal (for testing DVI) or fiber video signal (for testing fiber).

INSTALLATION INSTRUCTIONS

System Test Installation

- 3 Connect Output 1 of the CXPS to the display using Black Diamond Video tested DVI (or fiber) cable.**

NOTE: If the distance to the display requires more than seven meters of DVI cable, a Black Diamond Video DVI X-treme Cable Kit should be used with the DVI X-treme II Conditioner.

If a DVI X-treme Cable Kit is needed, do the following:

- a** Connect the long length of cable from Output 1 of the CXPS to the input of the DVI X-treme II Conditioner.
 - b** Connect the output of the DVI Xtreme II Conditioner using the short length of DVI cable to the display. The red indicator light on the DVI X-treme II Conditioner indicates a good DVI signal is being transmitted to the display.
- 4 Within the serial port terminal, type in the command: `sw 1 1`.**

Input 1 is switched to display to Output 1. Video should now be displayed on your test output device.
 - 5 Move the output cable from Output 1 to Output 2 so that Output 2 is now connected to the display device.**
 - 6 Within the serial port terminal type in the command: `sw 1 2`.**

Input 1 is switched to display to Output 2. Video should again appear on the test output device.
 - 7 Repeat steps Step 5 and Step 6, moving the output DVI or fiber cable to each of the remaining output channels in turn. Use the SWITCH command to route the video through the connected channel. Verify the video displays properly through each output channel, for all DVI and fiber outputs.**
 - 8 Move the input DVI or fiber cable from Input 1 to Input 2 so that Input 2 is now connected to the test signal source.**
 - 9 Within the serial port terminal, type in the command: `sw 1 [output #]`, where [output #] is the output channel which is currently connected to your test display device.**
 - 10 Repeat Step 8 and Step 9, moving the input cable to each of the remaining input channels in turn, using DVI or fiber cable as needed. Use the SWITCH command to route the video from the connected channel. Verify the video displays properly coming from each input channel, for fiber and DVI inputs.**

This completes the system test installation.

FINAL SYSTEM INSTALLATION

Once you have completed a thorough test of your CXPS equipment you are ready to do the final system installation. The final system installation consists of the following series of steps:

Step 1: AC Power Connection

WHAT YOU WILL NEED FOR THIS STEP

- Power cord (supplied)
- Surge protector (recommended)
- Line conditioner (recommended)

DESCRIPTION

Begin your final system installation by connecting the CXPS to an AC power supply and powering it up.

- 1 Connect the power cord (supplied) to the AC input on the CXPS.**
- 2 Plug the power cord into a surge protector (recommended).**
- 3 Plug the surge protector into a conditioned AC power source.**
- 4 Turn on the CXPS using the power switch on the rear panel.**

The status button on the front panel turns blue or green when the CXPS CPU is initialized and ready.

Step 2: Connect All DVI and Fiber Inputs

WHAT YOU WILL NEED FOR THIS STEP

- All DVI and fiber video input sources you want to display through the CXPS
- All non-DVI video sources you want to display through the CXPS
- DVI converters for the non-DVI, non-fiber video sources
- DVI cable
- Fiber cable

DESCRIPTION

Connect all DVI and fiber sources directly to the CXPS input channels. All non-DVI, non-fiber sources must first be converted to a DVI signal before they connecting them to the CXPS. See Figure 7, “System Installation Overview Diagram,” on page 27 for an illustration of a typical CXPS system diagram.



INSTALLATION INSTRUCTIONS

Final System Installation

- 1 Connect any dual-link DVI signals to DVI input connectors on cards in odd-numbered input slots only.**

The DVI input cards in the odd-numbered slots (that is, slots 1, 3, 5, 7, and 9) can accept dual-link DVI inputs. See "Dual-Link vs Single-Link" on page 12 for more information about dual-link DVI considerations.

- 2 Connect any single-link DVI or fiber signals to input connectors on any card.**

All DVI and fiber input channels can accept single-link inputs.

- 3 Apply DVI converters to any non-DVI signals and connect to input connectors on any CXPS DVI input card.**

Step 3: Connect CXPS Outputs to All Displays

WHAT YOU WILL NEED FOR THIS STEP

- All DVI or fiber-capable display devices you want to use in your installation
- DVI or fiber cable
- (Optional) DVI signal conditioners. If the distance to the display requires more than seven meters of DVI cable, a Black Diamond Video DVI X-treme Cable Kit should be used with the DVI X-treme II Conditioner and appropriate length of cable provided in the DVI cable kit.

DESCRIPTION

Connect all DVI or fiber-capable displays to the CXPS output channels. See Figure 7, “System Installation Overview Diagram,” on page 27 for an illustration of a typical CXPS system diagram.

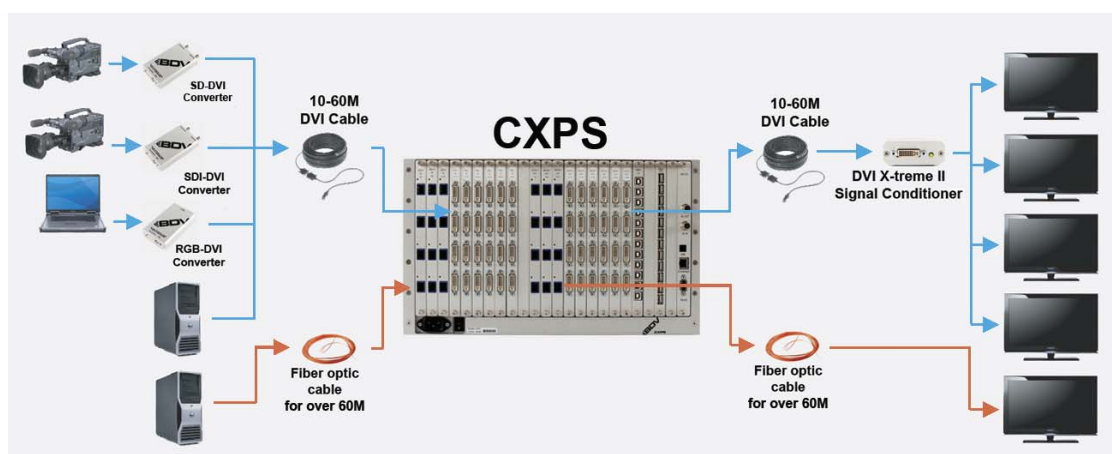


FIGURE 7. System Installation Overview Diagram

- 1** Connect DVI (or fiber) cable to first DVI (or fiber) output of the CXPS.
- 2** Connect the other end of the cable as follows:
 - a** If the DVI cable is more than seven meters in length, connect it to the input of the DVI X-treme II Conditioner. Connect a second DVI cable, no more than seven meters in length, to the DVI display device.
 - b** If the DVI cable is less than seven meters in length, connect it directly to the DVI display device.
 - c** For cable distances over 60 meters, use fiber cable to connect the CXPS to the display device.
- 3** Repeat Steps *Step 1* and *Step 2* for all other DVI and fiber output channels to be used in your installation.

NOTE: Displays capable of accepting dual-link DVI signals should be connected to output channels located on the DVI cards in odd-numbered slots. See “Dual-Link vs Single-Link” on page 12 for more information.

INSTALLATION INSTRUCTIONS

Final System Installation

Step 4: Establish Permanent Remote Control

WHAT YOU WILL NEED FOR THIS STEP

- Laptop or personal computer
- For RS-232 control: RS-232 direct-connect type serial cable with DB9 (male) connector
- For Ethernet control: Ethernet cable. If you are connecting your control computer *directly* to the CXPS, you may need a crossover cable.
- RS-232 and Telnet Commands:

SHOWNET		
ipaddr	<ipaddr>	
telnet	<ipaddr>	8998

DESCRIPTION

When all video sources going into the CXPS and all video outputs going to the displays or recording devices have been shown to function correctly, permanent control of the CXPS can be established using the RS-232 serial interface, 10/100T Ethernet interface, or the web-server GUI. Black Diamond Video recommends that you read this section carefully before establishing permanent controls.

IMPORTANT!

When connecting a control computer to the RS-232 connector on the CXPS, you must use a **direct-connect type cable**.
When connecting a control computer directly to the Ethernet connector you must use a **crossover cable**. Both the control computer and the CXPS must then use a static IP address.

Whether the CXPS is controlled through an RS-232 terminal, a 10/100T Ethernet port using telnet commands, or the web-server GUI, control begins with the RS-232 terminal. The RS-232 terminal is used to check and assign an IP address for the CXPS. Without configuring network settings, the network and web control *will not work*.

Details of the serial control commands and telnet protocols are in Appendix A, “RS-232 and 10/100T Protocol.”

Control of the CXPS can be accomplished using any one of the following five methods:

- **RS-232 Only**—This method is used when only RS-232 control is desired. Controls are managed using the CXPS command set (Appendix A).
- **10/100 T Ethernet and RS-232**—This method is used when 10/100T Ethernet control of the CXPS is desired and the control computer is a client on a larger network which uses DHCP (dynamic host configuration protocol) to assign IP addresses. This is the

default setting for 10/100T Ethernet control of the CXPS. RS-232 control is used to determine the dynamic IP address of the CXPS.

- **10/100 T Ethernet Only**—This is a simpler method than control by 10/100 T Ethernet and RS-232, but it requires that a static IP address be assigned to the CXPS and to the control computer. A static IP address is where a computer uses the same address every time a user logs on to a network. By default, the CXPS is configured with a dynamic IP address.

The type of IP address for the control computer depends upon whether the computer is connected directly to the CXPS Ethernet connector, or if it is connected via a network:

Connection Route	IP Address Type
Direct to CXPS	Static only
Through a network	Dynamic or Static

If the computer controlling the CXPS is a client assigned to a larger network, the network administrator will need to assign the static IP address to the control computer and CXPS. If the static IP address of the CXPS is unknown, it can be accessed via the RS-232 interface using the **SHOWNET** command. The RS-232 controls must be used for initial set-up of the CXPS IP address, and thereafter will no longer be required.

- **Web-Server GUI and RS-232 Control**—This method uses a web-server GUI rather than Telnet commands to control the CXPS over a network. In this instance, the control computer is a client on a larger network which uses DHCP to assign IP addresses. The web-server GUI within the CXPS is invoked by opening a web browser on the control computer (Black Diamond Video recommends Mozilla Firefox) and entering the IP address of the CXPS into the address bar of the browser. This will bring you to the GUI log-in page.
- **Web-Server GUI without RS-232 Control**—With this method, a “static” IP address is assigned to the CXPS and the control computer. A web-browser (Black Diamond Video recommends Mozilla Firefox) is opened and the static IP address of the CXPS is entered into the address bar of the browser. This is the easiest method for controlling the CXPS.

NOTE: The default password needed to log in to the GUI is *blackdiamond*.

RS-232 ONLY

- 1 Connect the control computer to the RS-232 connector on the CXPS using an RS-232 direct-connect type cable.
- 2 Open up a serial port terminal on the control computer connected to the CXPS.

INSTALLATION INSTRUCTIONS

Final System Installation

On Microsoft Windows, you can use HyperTerminal for serial communications.

3 Configure the port settings as follows:

- Baud: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

The RS-232 connection to the CXPS is established and the processor can be controlled using the RS-232 command set found in Appendix A, “RS-232 and 10/100T Protocol.”

NOTE: To avoid recreating the connection parameters each time you reestablish RS-232 connection to the CXPS, you can save the connection for subsequent hyperterminal sessions.

10/100T ETHERNET AND RS-232

- 1 Connect the CXPS to your network using the Ethernet connector.**
- 2 Connect the RS-232 control computer to the CXPS with an RS-232 direct-connect type cable.**
- 3 From the RS-232 control computer, determine the CXPS IP address:**
 - a** Establish RS-232 control of the CXPS as described in “RS-232 Only” on page 29.
 - b** Enter the command: `SHOWNET` (see Appendix A, “RS-232 and 10/100T Protocol,” for details).

The CXPS IP address is returned.

- 4 From the Ethernet control computer, which must be connected to the same network as the CXPS, open All Programs > Accessories > Command Prompt and enter the command `telnet <IP address> 8998` using the IP address obtained in Step 3.**

The Telnet session is initiated.

- 5 Enter the network password.**

The default network password is “blackdiamond”.

Telnet control is established. See Appendix A, “RS-232 and 10/100T Protocol,” for a list of key commands and how they are used to control the CXPS.

NOTE: The RS-232 control computer and the Ethernet control computer can be the same machine or two different machines.

To exit the network connection, enter the command `exit`.

NOTE: If the CXPS is powered off for several days, when the equipment is powered back on, the DHCP server within the network may issue a new IP address. If this happens, 10/100T Ethernet control can only be restarted by beginning at *Step 3* and determining the new IP address using the RS-232 SHOWNET command again.

10/100T ETHERNET ONLY

- 1** Connect the control computer directly to the CXPS with an RS-232 direct-connect type cable and a 10/100T Ethernet crossover cable.
- 2** Set the static IP address of the CXPS:
 - a** Establish RS-232 control of the CXPS as described in “RS-232 Only” on page 29.
 - b** Issue the `IPADDR` command using the static IP address assigned to the CXPS. For example:

`IPADDR 192.168.1.103`

The CXPS is assigned the static IP address 192.168.1.103.
- 3** Set the static IP address of the control computer. If you are using Microsoft Windows, follow these steps:
 - a** Click *Start > All Programs > Accessories > Communications > Network Connections*.
The Network Connections window appears.
 - b** Right-click on *Local Area Connection* and select *Properties*.
The Local Area Connection Properties window appears.
 - c** Click on *Internet Protocol (TCP/IP)* to highlight it and click *Properties*.
The Internet Protocol (TCP/IP) Properties window appears.
 - d** Select *Use the following IP address* and enter the static IP address assigned to your control computer into the IP address field.
For example, enter `192.168.1.10`.
 - e** Click on *Subnet mask* and the number `255.255.255.0` should appear.
 - f** Enter the static IP address in the Default gateway field.
For example, enter `192.168.1.1`.
 - g** Click *OK*.

INSTALLATION INSTRUCTIONS

Final System Installation

The static IP address of the control computer is set.

- 4 Click Start and navigate to All Programs > Accessories > Command Prompt.**

The Command Prompt window appears.

- 5 Enter the command `telnet <IP address> 8998` using the IP address assigned to the CXPS in Step 2 above.**

Telnet control is established. See Appendix A, "RS-232 and 10/100T Protocol," for a list of commands and how they are used to control the CXPS.

Because the CXPS now has a static IP address, the RS-232 interface is no longer required. If the IP address of the CXPS is misplaced, simply reconnect the RS-232 controls and use the SHOWNET command to retrieve the IP address.

The final system installation process is complete.

WEB-SERVER GUI AND RS-232

- 1 Download Java software onto the RS-232 control computer:**

- a** Open your web browser and go to www.java.com.

Download the appropriate version for your operating system.

- b** Black Diamond Video supports Java Applet versions up to 5.0.

- 2 (Recommended) Download and install the Mozilla Firefox web browser onto the control computer from www.mozilla.com/firefox/.**

- 3 Connect the control computer directly to the CXPS with an RS-232 direct-connect type cable and a 10/100T Ethernet crossover cable.**

- 4 From the RS-232 control computer, determine the CXPS IP address:**

- a** Establish RS-232 control of the CXPS as described in "RS-232 Only" on page 29.
- b** Enter the command: SHOWNET (see Appendix A, "RS-232 and 10/100T Protocol," for details).

The CXPS IP address is returned.

- 5 Open the Firefox web browser on the control computer and enter the IP address obtained in Step 4 into the browser address bar.**

The GUI is initiated and control of the CXPS is now done through the GUI.

NOTE: If the CXPS is powered off for several days, when the equipment is powered back on, the DHCP server within the network may issue a new IP address. If this happens, web-server GUI control can only be restarted by beginning at Step 3 and determining the new IP address using the RS-232 SHOWNET command again.

WEB-SERVER GUI ONLY

- 1 Download Java software onto the RS-232 control computer:**

- a Open your web browser and go to www.java.com.
 - b Download the appropriate version for your operating system.
 - c Black Diamond Video supports Java Applet versions up to 5.0.
- 2 (Recommended) Download and install the Mozilla Firefox web browser onto the control computer from www.mozilla.com/firefox/.**
- 3 Connect the control computer directly to the CXPS with an RS-232 direct-connect type cable and a 10/100T Ethernet crossover cable.**

NOTE: The RS-232 control computer and the Ethernet control computer can be the same machine or two different machines.

- 4 Set the static IP address of the CXPS:**
- a Establish RS-232 control of the CXPS as described in “RS-232 Only” on page 29.
 - b Issue the IPADDR command. For example:

IPADDR 192.168.1.103

The CXPS is assigned the static IP address 192.168.1.103.
- 5 Set the static IP address of the control computer. If you are using Microsoft Windows, follow these steps:**
- a Click *Start > All Programs > Accessories > Communications > Network Connections*.
The Network Connections window appears.
 - b Right-click on *Local Area Connection* and select *Properties*.
The Local Area Connection Properties window appears.
 - c Click on *Internet Protocol (TCP/IP)* to highlight it and click *Properties*.
The Internet Protocol (TCP/IP) Properties window appears.
 - d Select *Use the following IP address* and enter the IP address assigned to your CXPS into the IP address field.
For example, enter 192.168.1.10.
 - e Click on *Subnet mask* and the number 255.255.255.0 should appear.
 - f Enter the static IP address in the Default gateway field.
For example, enter 192.168.1.1.
 - g Click *OK*.

INSTALLATION INSTRUCTIONS

System Reset

The static IP address, subnet mask, and IP address gateway of the control computer are set.

- 6 **Open the Mozilla Firefox web-browser and type the CXPS IP address set in Step 4 into the address bar of the browser and press Enter.**

The GUI will be invoked and control of the CXPS is now done through the GUI. Details of the web-server GUI controls are in Chapter 7, "Matrix Switching."

Because the CXPS now has a static IP address, the RS-232 interface is no longer required. If the IP address of the CXPS is misplaced, simply reconnect the RS-232 controls and use the SHOWNET command to retrieve the IP address.

SYSTEM RESET

Occasionally, the CXPS CPU may need to be reset. Prior to installing the equipment in its final position, you can simply power cycle the unit using the power switch on the rear panel. However, once the unit is installed, it may not be easy to access the rear panel. In this situation, you can use the RS-232 serial command: RESET.

NOTE: The system reset mimics a power cycle and does not affect your system configuration settings, such as matrix routing settings.

CHANGING I/O CARD CONFIGURATION

Input and output cards may be added or removed from the CXPS as needed. The following is applicable for Firmware versions 4.85 and previous.

After installing a new card:

- 1 **Issue the RESTOREDEFAULT command to restore the factory defaults for user parameters.**
The command syntax is: RFD
- 2 **Issue the command RSTOUTPUTATTR to reset the output gamma, lower, upper, brightness, and contrast to the default values.**

The command syntax is: RSTOUTPUTATTR

NOTE: If you are installing a USB card in a CXPS that did not previously contain a USB card, contact Black Diamond Video at (877) 549-6600 for assistance. Technical support will provide a command to change the product type of your unit from CXPS to CXPS_USB.

STARTUP MACRO

The Startup Macro feature allows the user to set up a list of commands that will be executed automatically by the CXPS after it is powered on, or after a power cycle or interruption. This feature is available beginning with firmware version 4.85. There are four commands related to the Startup Macro: CSM, DSM, RSM, and VSM.

These Startup Macro commands are detailed below.

Create Startup Macro

The CSM command creates the Startup Macro. To create the startup Macro:

- 1 Issue the command: CSM.**
- 2 Enter the commands you would like stored in the Macro, up to 2048 characters.**
 - a** Editing the Macro commands is difficult to do in the terminal program as it is not a text editor. Therefore, it is suggested that a real text editor be used to create or edit the Macro. The commands may then be copied and pasted into the command prompt.
- 3 Press Esc.**
- 4 Press carriage return.**

Delete Startup Macro

The DSM command deletes the Startup Macro. To delete the Startup Macro, issue the command: DSM.

Run Startup Macro

The RSM command runs the Startup Macro manually. After powering the system on, the Startup Macro will run automatically. To run the Startup Macro manually, issue the command: RSM.

View Startup Macro

The VSM command allows the user to view the commands in the Startup Macro. To view the commands in the Startup Macro, issue the command: VSM.



INSTALLATION INSTRUCTIONS

Startup Macro

ABOUT THE WEB-SERVER GUI

Matrix switching can be handled using the web-server GUI. This chapter describes how to access the GUI web-server and introduces the GUI's appearance and function.

More information on using the GUI appears in the following operational chapters covering matrix switching.

ACCESSING THE GUI

NOTE: Java Applet must be installed prior to opening the web-server GUI. For instructions, see Chapter 5, "Installation Instructions."

The web-server GUI within the CXPS is invoked by opening a web browser on the control computer (Black Diamond Video recommends Mozilla Firefox) and entering the IP address of the CXPS into the address bar of the browser. This will bring you to the GUI log-in page, shown in *Figure 8*. Logging in will give you access to the GUI Web Controller page, "Matrix."

Log into the GUI by entering your password. The default password associated with your CXPS is *blackdiamond*.

ABOUT THE WEB-SERVER GUI

Appearance and Functions of the GUI

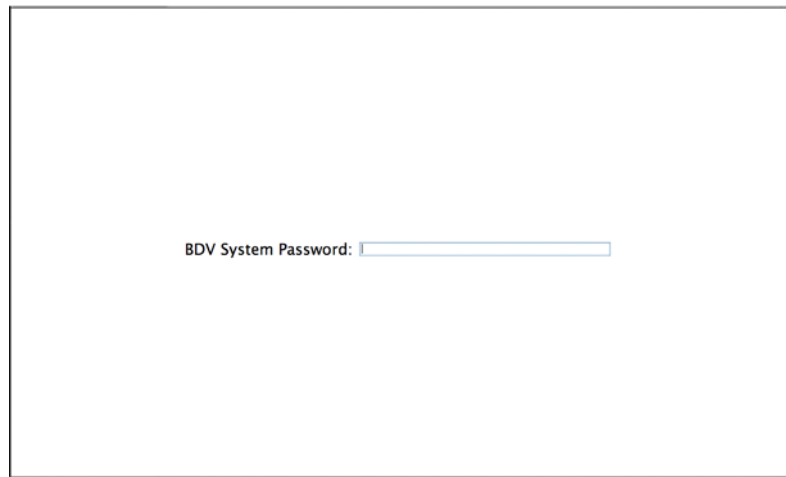


FIGURE 8. CXPS GUI Log-In Page

APPEARANCE AND FUNCTIONS OF THE GUI

The GUI Web Controller currently offers one section: Matrix.

- **Matrix**—this section allows you to switch between input sources and output displays using a mouse or touch-panel. The switch section of the GUI reflects only the last input to be selected and the output sources to which it is currently routed. Their input and output buttons are illuminated green, indicating that they are connected.

ABOUT THE WEB-SERVER GUI

Appearance and Functions of the GUI

For example, in *Figure 9*, the most-recently selected input is Input 2, shown by the green Input 2 button. Input 2 is routed to Output 1, indicated by the green Output 1 button.

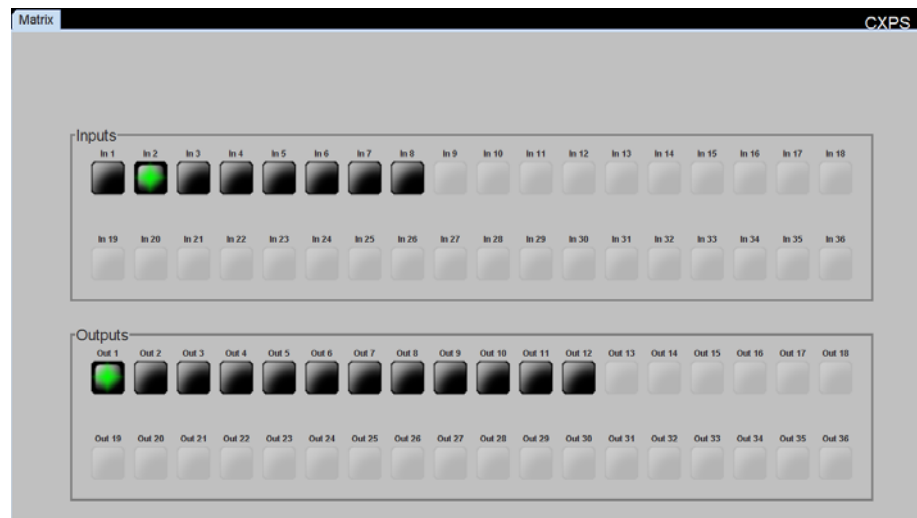


FIGURE 9. CXPS GUI Matrix Section

For information about switching using the Matrix section of the web-server GUI, see Chapter 7, “Matrix Switching.”



ABOUT THE WEB-SERVER GUI

Appearance and Functions of the GUI

MATRIX SWITCHING

This chapter describes the matrix switching capabilities of the CXPS.

ABOUT MATRIX SWITCHING

The CXPS provides 36 x 36 DVI matrix switching and is controlled with the web-server GUI or by using RS-232 or Telnet commands. Any connected input's channel can be switched to any output channel.

For information about setting up remote control of your device, see “Step 4: Establish Permanent Remote Control” on page 28.

MATRIX SWITCHING CONTROL: GUI

The GUI I/O buttons found on the Matrix page of the GUI let you quickly and easily set up and modify input-output assignments. *Figure 10* shows an example of the CXPS GUI being used to control matrix switching assignments.

MATRIX SWITCHING

Matrix Switching Control: GUI

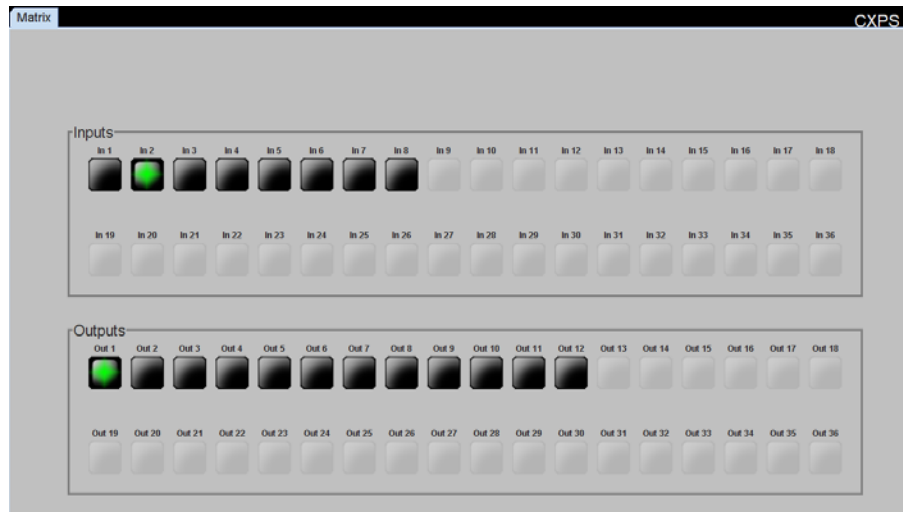


FIGURE 10. Matrix-Switching Section of the GUI Web Controller

The dark gray input and output buttons on the GUI represent the inputs and outputs of the connected CXPS. The GUI for a fully configured CXPS will have 36 input buttons and 36 output buttons.

To switch an input to an output

- 1 In the Matrix page of the GUI, click on a numbered input button to select the input you want to switch.

The button will flash green, indicating that it has been selected. You now have 5 seconds to route it to an output destination.

- 2 Click the Output button for the output to which you want to route the selected input.
- 3 The selected input is now routed to the output channel you have just chosen.

Both input and output buttons will be illuminated green to indicate their connection.

EXAMPLE ONE

To route Input 1 to display at Output 6, you first select the Input 1 button, and then promptly select the Output 6 button. This will route Input 1 to Output 6.

EXAMPLE TWO

To route Input 1 to display at Outputs 6 *and* 7, select the Input 1 button, then select the Output 6 button, routing Input 1 to Output 6. Then, select the Input 1 button again, and select the Output 7 button, routing Input 1 to Output 7.

To view individual input-output assignments: GUI Matrix Page

Individual input-output assignments can be viewed by pressing the numbered output buttons found in the Outputs section of the Matrix page. Selecting a numbered output button will illuminate both the selected button and the input button to which it has been routed.

EXAMPLE

To see what input is routed to Output 1, press the Output 1 button. In our example, *Figure 10*, you can see that Input 2 is routed to Output 1, as indicated by the green lights illuminating their respective buttons.

MATRIX-SWITCHING CONTROL: RS-232 AND TELNET

Using RS-232/Telnet commands, you can control input-output assignments, determine which input is routed to a particular output, and even simultaneously switch input-output assignments.

By default, the first single-link DVI input is routed to all single-link outputs and the first dual-link DVI input is routed to all dual-link outputs. Single-link DVI inputs can be displayed on any output channel, but dual-link DVI inputs can only be displayed on the output channels on the cards in odd-numbered slots. For more information on this limitation, see “Dual-Link vs Single-Link” on page 12.

For a complete list of serial control commands, see Appendix A, “RS-232 and 10/100T Protocol.”

NOTE The CXPS' RS-232 and Telnet commands and Telnet protocol are identical.

Switch Command

The SWITCH command is used to route any input to display on any output channel. The command is:

SW <input #> <output #>

An input can be routed to multiple outputs, which lets you display the same input image on multiple displays.

Matrix-Switching Control: RS-232 and Telnet

EXAMPLE

In *Figure 11*, the switch command is used to route a DVI video source connected to Input 3 to three different output channels. If all three commands are issued in succession, the result is that Input 3 would appear on all three output devices.

Command	Action
SW 3 1	Example A —routes Input 3 to Output 1
SW 3 2	Example B —routes Input 3 to Output 2
SW 3 5	Example C —routes Input 3 to Output 5

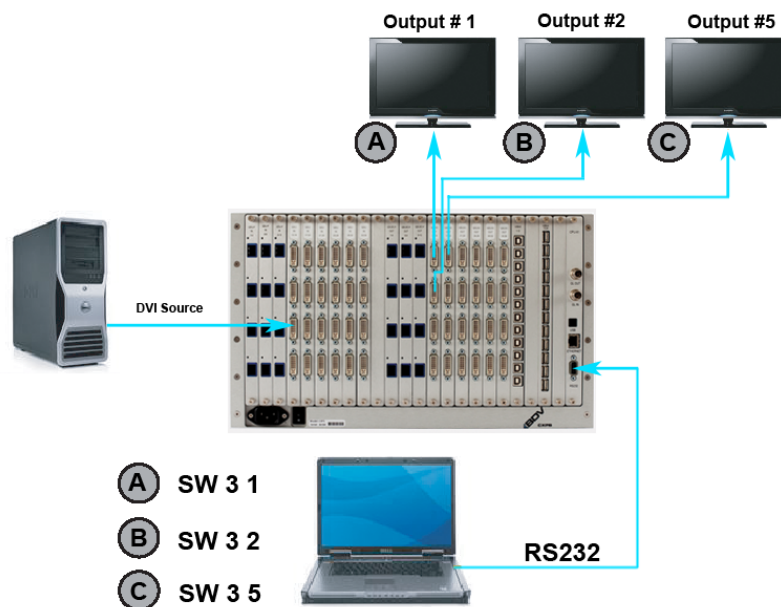


FIGURE 11. Matrix Switching Example

Output Status Command

The **OSTAT** command is used to determine which input is set to display on particular output. The command is:

```
OSTAT <output #>
```

EXAMPLE

Referring to *Figure 11*, the OSTAT command would be used as follows:

Command	Action
OSTAT 1	Checks the input channel routed to Output 1. Returns input: 3.

Simultaneous Switching Outputs

Using RS-232/Telnet *Simultaneous Switching Outputs* commands, you can change multiple input-output assignments simultaneously using preset input-output pairs.

The steps required to perform simultaneous matrix switching are listed below.

1. SET INPUT-OUTPUT PAIRS

The Simultaneous Switching Outputs (SSO) command allows the user to store input-output pairs in ten different preset slots. The maximum number of I/O pairs is equal to the maximum channels installed.

To store input-output pairs to a preset slot (numbered 1-10), issue the command:

SSO <preset#> <input> <output> <input> <output> <input>
<output>

Where:

- <input> <output> represents an input-output pair.
- <preset #> refers to the preset slot (1-10) to which you would like to store these switching pairs.

To delete the preset input-output assignments, issue the command:

SSODEL <preset#>

This will erase the I/O pair assignments you had saved to that preset slot.

2. SIMULTANEOUSLY SWITCH OUTPUTS

Once you have assigned input-output pairs to a preset slot number (1-10), you may simultaneously switch all inputs to display on their specified output.

MATRIX SWITCHING

Matrix-Switching Control: RS-232 and Telnet

To simultaneously switch outputs using the preset input-output pairs, issue the command:

SSORUN <preset#>

This will switch each input to display on its paired output, as specified by the pairs you selected in the previous step.

USB Switching

USB switching is an optional CXPS feature. USB switching may be performed using the three USB commands below.

USB COMMAND

Change USB switching mode by issuing the command:

USB <mode>

Where <mode> is either “lock” or “free.”

- When in lock mode, USB switching assignments will follow the video switch assignments. For example, if you issue the video switch command **SW 1 2** to route input 1 to output 2, this would also switch USB 1 to 2.
- When in free mode, USB switching assignments will *not* follow video switching assignments, and the user must issue the **USBSW** command to perform USB switching, as described below.

USB SWITCH COMMAND

The USB Switch command controls USB switching when under free mode. Use the command:

USBSW <usb input #> <usb output #>

USB STATUS COMMAND

The USB Status command displays the USB Input/Output connections and also the USB mode selected.

To view USB status, issue the command: **USBSTAT**

VIDEO SCALING

ABOUT VIDEO SCALING

The CXPS output slots can each be populated with a scaler card- for a maximum of nine scaler cards possible. A Quad Dual-Link Scaler card (QDLS card) may be used in odd-numbered slots, while a Quad Single-Link Scaler card (QSLs card) may be used in odd or even numbered slots.

With a scaler card, the output's image can be scaled up or down or modified to fit a display resolution different than the native resolution of the input signal. Scaler cards also supply the CXPS with video windowing, wall processing, and video dissolve capabilities.

The most common scaler operations are discussed below. Scaler operations are performed using RS-232/ Telnet control.

- For more about configuring the CXPS output channels, see Chapter 3, "Configuration Options."
- For information on windowing capabilities, see Chapter 9, "Video Windowing."
- For information on video dissolve features, see Chapter 10, "Dissolve and Force Effects."
- To learn about wall processing capabilities, see Chapter 11, "Wall Processing."
- For a complete list of RS-232 and Telnet serial control commands, see Appendix A, "RS-232 and 10/100T Protocol."

NOTE RS-232 commands and Telnet protocol are identical.

AUTO-RESOLUTION DISPLAY

By default, any input routed through a QDLS card output channel is automatically scaled up or down to fit the resolution of the connected display device. The original aspect ratio of the input image is maintained. If this input aspect ratio is different than that of the display device, black bars will fill areas of unfilled pixels.

Auto-resolution display is an automatic feature of the scaler card and does not need to be programmed. This feature automatically detects the display resolution and displays any input source at its maximum resolution and proper aspect ratio.

VIDEO SCALING

Preset Video Positioning

For example, if you have a 1024 x 768 input and you route it through a QDLS output to a display device operating at 1900 x 1200, the image is automatically scaled up to fill the screen vertically. Black bands appear on either side of the image in the areas of unfilled pixels, and the 4:3 aspect ratio is maintained on the output.

PRESET VIDEO POSITIONING

In addition to the default auto-resolution display processing, video going out to a display device can be positioned in different ways to fit within the display. *Figure 12* illustrates the four most common methods for positioning video within a display.



FIT

Full image is displayed with the proper aspect ratio at the display's maximum resolution.



CENTER

Full image is displayed at the image's native resolution, with a proper aspect ratio, and centered on the display.



FILL

Either full vertical or horizontal portion of the image is displayed, with remaining portion of the image cropped. Aspect ratio is maintained.



STRETCH

Image is stretched to fit onto the display without cropping when the aspect ratio of the input is different than that of the display device. The aspect ratio will not be maintained if the image is stretched.

FIGURE 12. Video Output Positioning Presets

FIT

FIT scales an image up or down to match a display's maximum resolution. At the same time, the proper aspect ratio of the video input is maintained and the entire picture is visible. The entire output image is "fit" onto the display.

EXAMPLE ONE

To display the 800 x 600 image (4:3 aspect ratio) coming from Output 1 on a 1920 x 1080 display (16:9 aspect ratio) by scaling the image up such that the entire image is visible, and maintaining its proper 4:3 aspect ratio, use the **FIT** function. Vertical black bars will appear on either side of the image in areas of unfilled pixels.

EXAMPLE TWO

To display the 1920 x 1080P image coming from Output 5 on a 1280 x 1024 display (5:4 aspect ratio) by scaling the image down and maintaining its 16:9 aspect ratio, use the **FIT** function. Horizontal black bars will appear above and below the image in areas of unfilled pixels.

NOTE: **FIT** is actually the same as auto-resolution (see "Auto-Resolution Display" on page 47). You can use the **FIT** control to return to this default processing behavior after setting an alternative video position, such as with the **CENTER**, **FILL**, or **STRETCH** controls, or with a custom setting.

CENTER

CENTER maintains the native resolution of the image and centers it within a display that has a different resolution. The output image is "centered" on the display and surrounded by black borders in the area of unfilled pixels.

EXAMPLE

To display the 800 x 600 image coming from Output 1, at its native resolution, centered and surrounded by black borders on a 1280 x 1024 display, use the **CENTER** function.

FILL

FILL scales an image up or down to match a display's maximum resolution and also maintains the proper aspect ratio of the video input. Unlike the **FIT** mode, however, the entire image may or may not be displayed. If the input aspect ratio matches the aspect ratio of the display device, the entire image will appear. However, if the aspect ratios are different, then one dimension of the image will be cropped.

When scaling up, the image is scaled until it fills the screen both horizontally and vertically. With different aspect ratios, this means that the dimension which required less scaling

VIDEO SCALING

Preset Video Positioning

before filling the screen is cropped as scaling continues in order to fill the screen in the other dimension.

When scaling down, the image is scaled until one dimension fills the screen. At that point, scaling ceases and the other dimension is cropped.

EXAMPLE

To display the 800 x 600 image (4:3 aspect ratio) coming from Output 1 on a 1920 x 1080 display (16:9 aspect ratio) by scaling the image up and maintaining its proper 4:3 aspect ratio so that it fills the entire display, use the **FILL** function.

As more scaling is required to fill the horizontal dimension than the vertical dimension, the image fills the screen and is cropped vertically on the display.

STRETCH

STRETCH “stretches” an image to fit onto the display without cropping when the aspect ratio of the input is different than that of the display device. The resulting image may be horizontally and/or vertically stretched to fit onto the entire display, and thus will not maintain its original aspect ratio.

EXAMPLE

To display the 800 x 600 image coming from Output 1, stretched to fit a 1280 x 1024 display, use the **STRETCH** function. The image will be stretched both horizontally and vertically to fit the display screen.

Video Positioning Control: RS-232/ Telnet

All four of the video positioning methods use the **OWS** command paired with an argument to select the positioning method: **FIT**, **CENTER**, **FILL** or **STRETCH**.

FIT COMMAND

The command is:

OWS <output #> FIT

where <output #> is the number of your chosen output. For example, to scale the image displayed on Output 1 to “fit” the output’s maximum resolution, while still keeping all of the image visible, issue the command **OWS 1 FIT**.

CENTER COMMAND

The command is:

OWS <output #> CENTER

where <output #> is the number of your chosen output. For example, to center the image displayed on Output 1, issue the command **OWS 1 CENTER**.

FILL COMMAND

The command is:

OWS <output #> FILL

where <output #> is the number of your chosen output. For example, to fill the display on Output 1, issue the command **OWS 1 FILL**.

STRETCH COMMAND

The command is:

OWS <output #> STRETCH

where <output #> is the number of your chosen output. For example, to stretch the image displayed on Output 1, issue the command **OWS 1 STRETCH**.

CUSTOM VIDEO POSITIONING

Besides the preset video function of the QDLS card, you can also assign specific horizontal and vertical dimensions to a video output using RS-232 or Telnet control. With this function, aspect ratios are not constrained, and, depending on the custom dimensions you specify, the original aspect ratio may not be preserved.

The command is:

OWS <output #> <hsize> <vsize>

where <hsize> represents a custom number of display pixels and <vsize> represents a custom number of lines.

EXAMPLE

To display an 800 x 600 image from Output 3 as a 1280 x 1024 image size, and not maintain the original 4:3 aspect ratio, issue the command: **OWS 3 1280 1024**.

The image is scaled up from 800 x 600 to 1280 x 1024, with a modified aspect ratio of 5:4.

PAN AND ZOOM

The QDLS card output offers both pan and zoom functions. These functions let you focus on portions of an image and increase and decrease the zoom, and can be engaged using RS-232 or Telnet control.

For instructions on panning and zooming in windowing mode, see “Zooming and Panning Within a Window” on page 71.

VIDEO SCALING

Pan and Zoom

Pan and Zoom: RS-232/Telnet

When using RS-232 or Telnet control, you have two types of pan/zoom controls. The first is a step pan or zoom, where you pan or zoom a percentage each time you issue the command. The second type of control is a continuous pan or zoom. This type of zoom is meant for use with a programmable external control device.

PAN

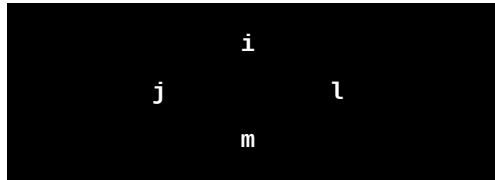
With the PAN command, you can to pan up, down, left, and right at slow or accelerated speeds.

The command is:

PAN <output #>

When you issue this command, the following field appears to let you control the pan action:

Pan control: i - up, m - down, j - left, l - right q - quit



Each time you press one of these letters, you pan in the selected direction by a set percentage.

Accelerated pan control: use + or -



ZOOM

The standard zoom control lets you step zoom in or out of an image at slow or accelerated speeds.

The command is:

ZOOM <output #>

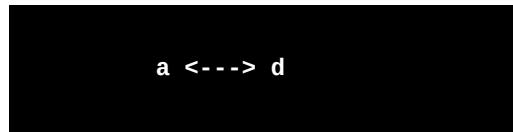
When you issue this command, the following field appears to let you control the zoom action:

Zoom control: <+> zoom in, <-> zoom out, <q> quit



Each time you press + or -, you zoom in or out a set percentage.

Accelerated zoom control:



CONTINUOUS PAN & ZOOM

In addition to the standard pan and zoom controls described above, there are special controls meant for use with a programmable external control device. The continuous pan and zoom controls lets you continue an action until the **STOP** command is issued.

For details on continuous pan and zoom controls, see “Continuous Pan & Zoom” on page 115.

ADVANCED VIDEO SCALING OPERATIONS

This section deals with advanced video scaling operations that are primarily applicable to custom applications. These scaling operations are employed using RS-232 or Telnet control, and are listed below:

Genlock

- Match the output timing to the input timing
- Turn off all output scaling

Programmable Look-up Tables

- Customize the red, green, and blue color values of an output
- Modify one or more color values for custom effects

Genlock

Genlocking video signals is used when you want to synchronize the output timing to the input timing *exactly*. The image is passed through to the output without any scaling or timing shift.

The command is:

GL <output #> <ON|OFF>

EXAMPLE

To genlock the output timing of Output 7 to the input source timing, issue the command:
GL 7 ON.

Programmable Look-Up Tables

The table below shows the four look-up table commands you can employ to customize your output’s color settings.

WBLUT	WBLUT <output #> <value>	Changes the output gain for blue channel. <value> is a value from 0-200. Default = 100.
WGLUT	WGLUT <output #> <value>	Changes the output gain for green channel. <value> is a value from 0-200. Default = 100.
WLUT	WLUT <output #> <value>	Changes the output gain for all three color channels: red, green, and blue. <value> is a value from 0-200. Default = 100.
WRLUT	WRLUT <output #> <value>	Changes the output gain for red channel. <value> is a value from 0-200. Default = 100.

VIDEO WINDOWING

ABOUT VIDEO WINDOWING

Overview

With video windowing, multiple input signals can be displayed on one output display screen using RS-232/Telnet commands. This is because each window is connected to an output channel, like an output display would be.

There are two types of windowing modes: standard windowing mode, which can create up to four windows in total, and picture-in-picture mode, which creates two windows. All windows can be individually positioned, scaled up or down, and cropped. Each window's image can also be panned, zoomed, fit, filled, centered, and stretched to suit your needs.

NOTE: This chapter is applicable to CXPS firmware version 4.00 and above.

VIDEO WINDOWING

About Video Windowing

CXPS Windowing Capabilities

It is useful to consider the CXPS output connector arrangement, *Figure 13*, when describing CXPS windowing capabilities.

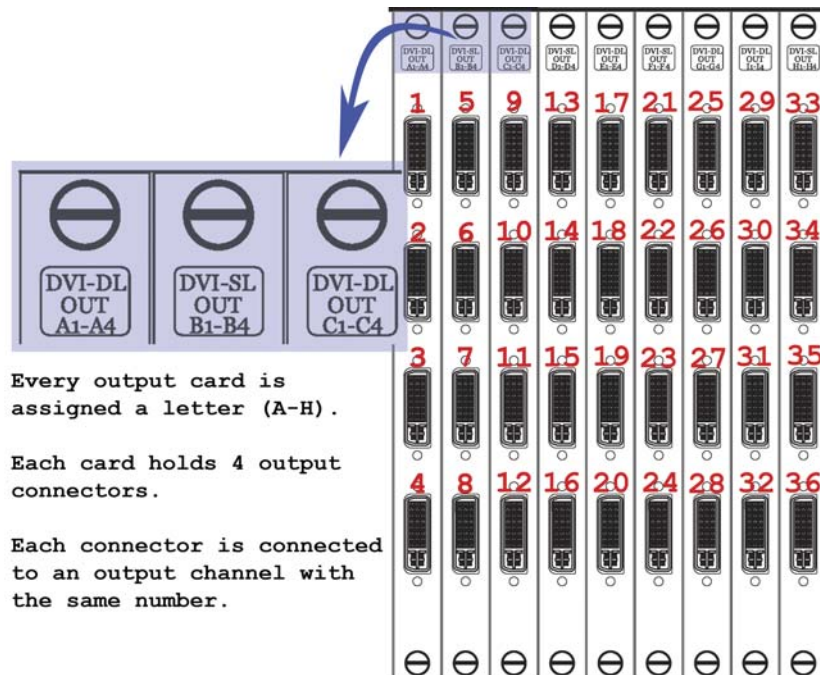


FIGURE 13. CXPS Output Connector Arrangement

The CXPS can be configured with up to 9 output cards (A through H), and each of those cards has 4 output channels.

When a window is created, it is also connected to an output channel, just like an output display would be, for a maximum of 9 sets of 4 windows. Issuing a command that will affect an output channel, such as a change in matrix switching assignment, will alter the video on any output display or window connected to that channel.

A window may only be created on an output channel that is on the *same* card as the channel connected to the output display screen. For example, output display 9 would be connected to output channel 9, which appears in card C in *Figure 13*. Any windows you create on output display 9 must be on channels also in card C, channels 9 through 12, for a maximum of 4

windows possible in standard windowing mode, and two windows in picture-in-picture mode.

NOTE: To change the video input routed to a window, perform the same steps as when routing an input to a normal output display screen, as described in Chapter 7, "Matrix Switching."

OUTPUT TIMING SYNCHRONIZATION

Overview

Before standard windowing function or picture-in-picture mode is enabled, the timings of each output channel that will contain a window must be synchronized to the timing of the windowing display.

NOTE: Output timing synchronization must be performed manually when using RS-232/Telnet control.

Setting the Output Timing

You may set the output timing of the windowing display, if desired, and then synchronize all other outputs to this new timing. If you are satisfied with the current output timing of the windowing display, proceed to the next section, "Synchronizing Output Timings" on page 58.

STEP 1: THE HOSTLIST COMMAND

Use the Hostlist command to find the number that represents the resolution you would like your windowing display to use.

To display the host table, use the HOSTLIST command, which will produce a list of output timings for each display's resolution. Find the resolution you would like your windowing display to use, and use the corresponding number with the SETOT command in the next step.

STEP 2: THE SETOT COMMAND

Use the Set Output Timing command to set the output timing of the channel connected to your windowing display.

The command is:

SETOT <display output #> <host>

Where:

VIDEO WINDOWING

Output Timing Synchronization

- `<display output #>` is the output channel number connected to the windowing display.
- `<host>` is a number from the host table that represents the output timing of the you would like the windowing display to use (see Step 1 for help finding this number).

Synchronizing Output Timings

Before windowing function is enabled, the timing of each output connected to a window must be synchronized to the timing of the windowing display using the Framesync or GFramesync command.

You may use the Framesync command to synchronize the output timing of channels that are not in a continual numerical range. Alternatively, use the GFramesync command to synchronize channels in a range.

THE FRAMESYNC COMMAND

Use the Framesync command to specify every output you would like to synchronize to the windowing display. The command is:

FRAMESYNC `<display output #>` `<slave1>`...`<slave3>`

Where:

- `<display output #>` is the number of the output channel connected to the windowing display.
- `<slave1>`...`<slave3>` are the numbers of the output channels other than `<master>` that are connected to windows.
- **Example:** You would like to create 3 windows on your display. The windowing display is connected to Output 4 and your windows will occupy output channels 1, 2 and 4. You will first need to synchronize outputs 1 and 2 to the timing of output 4. The command would be: FRAMESYNC 4 1 2

THE GFRAMESYNC COMMAND

You may use the GFRAMESYNC command if you would like to specify a range of channels to synchronize to the windowing display. This range must begin with the windowing display and end with the last output channel connected to a window. The command is:

GFRAMESYNC `<first output>` `<last output>`

Where:

- `<first output>` is the number of the output channel connected to the windowing display.

- <last output> is the number of the last channel in the range of output channels you would like to synchronize to <first output>.
- **Example:** You would like to create 3 windows on your display. The windowing display is connected to Output 2 and your windows will occupy output channels 2, 3, and 4. You will first need to synchronize outputs 3 and 4 to the timing of output 2. The command would be: GFRAMESYNC 2 4

STANDARD WINDOW FUNCTION

Windowing function can be turned on or off at a chosen output. When turning window function on, the user can select different configurations of windows to display on a composite output, with a total of four windows possible.

As mentioned previously, a window may only be created on an output channel that is on the same card as the channel connected to the output display screen. For example, output display 9 is connected to output channel 9, which appears in card C in *Figure 13*. Any windows you create on output display 9 can be created on channels 9 through 12- a maximum of four windows possible.

NOTE: Before enabling window function, the timing of each output channel that will contain a window must be synchronized to the first output channel on that card. See “Output Timing Synchronization” on page 57 for instructions.

Standard Window Function: RS-232/Telnet

TO ENABLE WINDOW FUNCTION

To turn windowing function on, issue the command:

```
WINON <display output #> <window #> <window #> <window #>  
<window #>
```

Where:

- <display output #> is the number of the output displaying the windows.

VIDEO WINDOWING

Picture-In-Picture

- `<window #>` is the number of the output channel you would like to use under windowing mode.

NOTE: You may only select output channels that are in the same card as the composite output's channel, as described in the "About Video Windowing" section and in Figure 13 on page 56.

- The sequence of the `<window #>` entries determines the initial priority of those windows.

EXAMPLE

You would like to create four windows on output display 9, one window each on output channels 9, 10, 11, and 12. You would like window 12 to have priority 1, window 10 to have priority 2, window 11 to have priority 3, and window 9 to have priority 4.

The command is: `WINON 9 12 10 11 9`

TO DISABLE WINDOW FUNCTION

To turn windowing function off, issue the command

`WINOFF <display output #>`

PICTURE-IN-PICTURE

Picture-in-picture is a special windowing mode that can be controlled via RS-232/Telnet commands. When picture-in-picture mode is on, one output will fill the entire background, and another output will be an inset window in the middle of the foreground, as shown in Figure 14.

NOTE: Before enabling picture-in-picture mode, the timing of each output channel that will contain a window must be synchronized to the first output channel on that card. See "Output Timing Synchronization" on page 57 for instructions.

To turn picture-in-picture mode on, issue the command:

`PIPON <display output #> <foreground> <background>`

Where:

- `<display output #>` is the number of the output displaying the windows.

- **<foreground>** is the number of the output that will be displayed as a window in the center of the foreground
- **<background>** is the number of the output that will be displayed as a window that fills the background, behind the window in the foreground.

To turn off picture-in-picture mode, use the command:

PIPOFF <display output #>

EXAMPLE

Suppose you want to enable picture-in-picture function on output display 1. You would like a window on output channel 2 to appear in the foreground, and a window on channel 3 to act as the background. The command would be:

PIPON 1 2 3



FIGURE 14. Picture-in-Picture Mode

VIDEO WINDOWING

Turning a Window On/Off

TURNING A WINDOW ON/OFF

Using an RS-232/Telnet Window command, you can turn an individual window on or off, without affecting other windows.

Window On/Off

To turn a window on or off, issue the command:

```
WIN <display output #> <window #> <ON|OFF>
```

Where:

- <display output #> is the number of the output displaying the windows.
- <window #> is the number of the window (1-36) you would like to control.

WINDOW IDENTITY

Window Identity

The Window Identity RS-232/Telnet command identifies the window belonging to a selected output channel, and provides the window's position and size.

After issuing the command, the selected window will be on top of other windows on the display screen, and will blink for 5 seconds. On the command line, the position and size of the selected window is returned.

To learn a window's identity, issue the command:

```
WINID <display output #> <window #>
```

Where:

- <display output #> is the number of the output displaying the windows.
- <window #> is the number of the output channel whose corresponding window you wish to identify

WINDOW PRIORITY

Window priority controls the order in which you would like your windows arranged on the output display screen; each window has its own priority. For example, if your display screen

houses a total of four windows, these windows would have numbered priorities 1 through 4, depending on their order.

The window priority control is useful when windows overlap on the display screen. Window Priority 1 is the foremost window location on the display screen. Setting any window to Priority 1 will bring it to the foreground, on top of any windows it was previously behind. Window Priority 2 is the window position second from the front; setting any window to Priority 2 will bring it to the front of every other window but the window set to Priority 1. In following, Window Priority 3 is the window position third from the front, and Window Priority 4 is the position fourth from the front.

An example of the effects of the window priority feature can be seen in *Figure 15*.

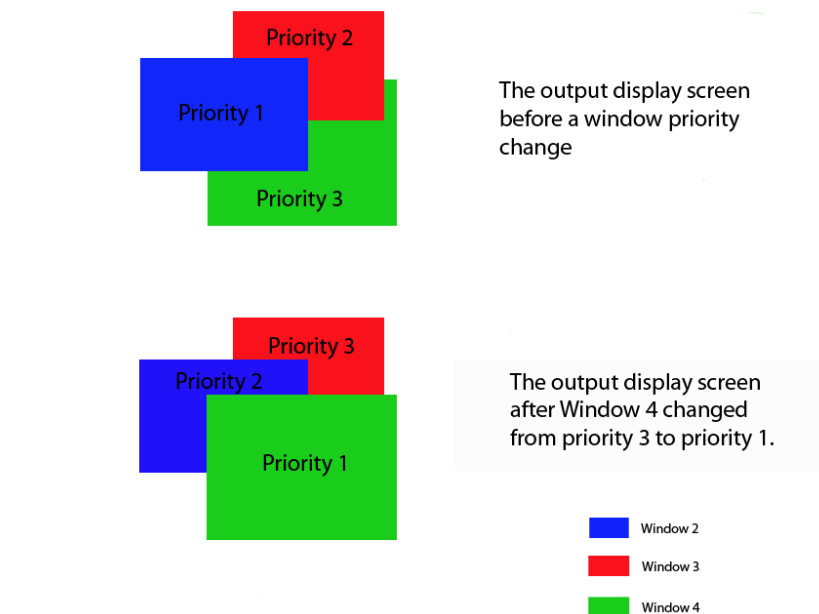


FIGURE 15. Window Priority Example

Window Priority:

To change an output's window priority using RS-232/Telnet commands, issue the command:

VIDEO WINDOWING

Window Position and Size

WINPRI <display output #> <window #> <priority>

Where:

- <display output #> is the number of the output displaying the windows.
- <window #> is the number of the window (1-36) you would like to control.
- <priority> is the priority number you would like to assign to the chosen output.

WINDOW POSITION AND SIZE

The position of each window on the output display can be independently manipulated using RS-232 or Telnet commands.

Window Position and Size

TO CONTROL WINDOW POSITION AND SIZE INTERACTIVELY

With the Window Position command, you are able to interactively control the positioning and size of the window for the selected output.

To control window position and size, issue the command

WINPOS <window #>

A control field will appear that will allow you to interactively position and size the window to suit your needs.

TO CONTROL WINDOW POSITION AND SIZE USING EXACT VALUES

With multiple arguments, the window is positioned at the specified location and size.

Issue the command:

WINPOS <window #> <hpos> <vpos> <hsize> <vsize>

Where:

- <window #> is the number of the window (1-36) you would like to control.
- <hpos> and <vpos> refer to the upper left corner of the window.
- <hsize> is in pixels.
- <vsize> is in lines.

TO ADJUST WINDOW ALIGNMENT

Using the window position alignment commands, you can adjust the position of the window while maintaining its size. You may center the window in the middle of the windowing output display, or you may adjust left, right, top, or bottom window alignment to move the selected window to the edge of the display screen in the selected direction.

To adjust the window's position on the composite output screen, issue the command:

WINPOS <window #> <LA | RA | TA | BA | CA>

Where:

- <window #> is the number of the window (1-36) you would like to control.
- <LA> is left align
- <RA> is right align
- <TA> is top align
- <BA> is bottom align
- <CA> is center align.

CONTINUOUS WINDOW POSITION & ZOOM

In addition to the standard window position controls described above, there are special controls meant for use with a programmable external control device. The continuous position and zoom controls lets you continue an action until the **STOP** command is issued.

For details on continuous window position and zoom controls, see "Continuous Window Position & Zoom" on page 116.

WINDOW DUALVIEW FORMATION

The DualView command can be used to arrange a maximum of two windows. This command sizes each window as closely to one half the size of the output display screen as possible, positioning one on the left and one on the right according to the priorities assigned to them when window function was enabled. Any portion of the window that cannot fit completely into one half of the display screen will extend out of view.

NOTE: Using a dual-link scaler card will allow windows to be downscaled 2:1. When in dualview formation, it is necessary for some windows to extend past the boundaries of the screen **ONLY** when using a single-link scaler card.

In dualview arrangement, the window assigned priority 1 will appear on the left half of the screen, and the window assigned priority 2 will appear on the right half of the display screen. An example of dualview formation can be seen in *Figure 16*. The shaded areas

VIDEO WINDOWING

Window Position and Size

represent the portions of the windows that might extend past the display screen when using a single-link scaler card.

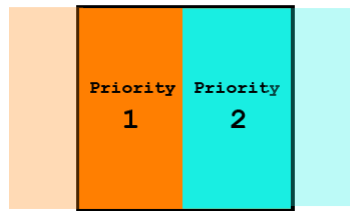


FIGURE 16. An output display containing windows in dualview formation

To arrange windows in dualview formation, issue the command:

DV <display output #>

Where:

- <display output #> is the number of the output displaying the windows.

Switching in DualView Formation

Switching an input to a window in dualview formation will resize the window to fit as closely as possible within the half of the screen assigned to that window. This means that the window may expand or shrink to fit into its area, with any remaining portions of the window extending off the screen.

Once a window is moved or zoomed, it is no longer in dualview formation. This means that switching an input to a window that has been repositioned or zoomed will fill that window with the chosen input's video. When using a single-link scaler card, this may require the window to expand to fit the size of the new input's video.

WINDOW TRIVIEW FORMATION

The TriView command can be used to arrange a maximum of three windows. This command arranges them into triview formation according to the priorities assigned to them when window function was enabled.

NOTE: Using a dual-link scaler card will allow windows to be sized down to approximately the size of a postage stamp. When in triview formation, it is necessary for some windows to extend past the boundaries of the screen **ONLY** when using a single-link scaler card.

In triview, the window assigned priority 1 will appear on the left half of the screen. The windows assigned priorities 2 and 3 will appear on the right half of the display screen, with the window holding priority 2 appearing on top of the window with priority 3. An example of triview formation can be seen in *Figure 17*. The lightly-colored areas represent the portions of the windows that might extend past the display screen when using a single-link scaler card.

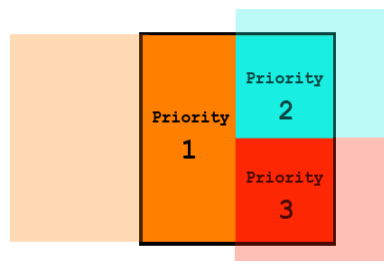


FIGURE 17. An output display containing windows in triview formation

To arrange windows in triview formation, issue the command:

TV <display output #>

Where:

- <display output #> is the number of the output displaying the windows.

Switching in TriView Formation

VIDEO WINDOWING

Window Position and Size

Switching an input to a window in triview formation will resize the window to fit as closely as possible within the portion of the screen assigned to that window. This means that the window may expand or shrink to fit into its area, with any remaining portions of the window extending off the screen.

Once a window is moved or zoomed, it is no longer in triview formation. This means that switching an input to a window that has been repositioned or zoomed will fill that window with the chosen input's video. When using a single-link scaler card, this may require the window to expand to fit the size of the new input's video.

WINDOW QUAD FORMATION

The Quadsplit command can be used to arrange a maximum of four windows. This command sizes each window to fit as closely to one quarter the size of the output display screen as possible.

NOTE: Using a dual-link scaler card will allow windows to be sized down to approximately the size of a postage stamp. When in quad formation, it is necessary for some windows to extend past the boundaries of the screen **ONLY** when using a single-link scaler card.

The windows are arranged in quad formation according to the priorities assigned to them when window function was enabled. An example of quad formation can be seen below, in *Figure 18*. The lightly-colored areas represent the portions of the windows that might extend past the display screen when using a single-link scaler card.

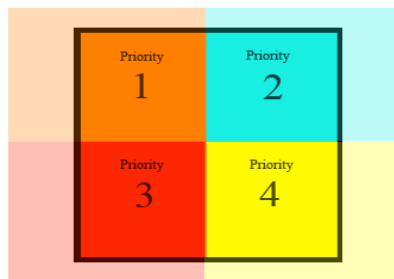


FIGURE 18. An output display containing windows in quad formation

To arrange windows in quad formation, issue the command:

QS <display output #>

Where:

- <display output #> is the number of the output displaying the windows.

Switching in Quad Formation

Switching an input to a window in quad formation will resize the window to fit as closely as possible within the 1/4 of the screen assigned to that window. This means that the window may expand or shrink to fit into its area, with any remaining portions of the window extending off the screen.

Once a window is moved or zoomed, it is no longer in quad formation. This means that switching an input to a window that has been repositioned or zoomed will fill that window with the chosen input's video. When using a single-link scaler card, this may require the window to expand to fit the size of the new input's video.

WINDOW CASCADE FORMATION

Use the Cascade command to arrange windows in cascade formation. When in cascade formation, the windows become equally sized and positioned in an overlapping arrangement that cascades diagonally across the display. These windows are organized in descending order (4,3,2,1) from left to right, according to their priorities, with the window assigned to priority 1 appearing in the forefront.

To arrange the windows in cascade formation, issue the command:

CC <display output #>

Where:

- <display output #> is the number of the output displaying the windows.

FULL SCREEN WINDOWING

The Window Full Screen command will expand the selected window to fill the entire display screen.

To fill the composite display screen with the selected window, issue the command:

WINFS <display output #> <window #>

Where:

VIDEO WINDOWING

Window Position and Size

- `<display output #>` is the number of the output displaying the windows.
- `<window #>` is the number of the window (1-36) you would like to control

WINDOW VIDEO POSITIONING PRESET TOOLS

Each individual window's displayed image may be independently manipulated via RS-232/Telnet Input Window Size command. These commands apply preset video positioning to the specified output channel.

NOTE: This command will affect window size and position.

To implement a preset video position, issue the command:

OVS `<window #> <FIT|FILL|CENTER|STRETCH>`

The effects of the four window video positioning preset tools are described below. For a more detailed description of the preset fit, fill, center, and stretch tools, see Chapter 8, "Video Scaling."

FIT

`<FIT>` fits the entire window onto the display, maintaining the original aspect ration. Equivalent to resetting the video scaling to the default auto-resolution display.

FILL

`<FILL>` scales a window up or down to fill the display, maintaining proper aspect ratio of the input. Image will be cropped if the input and output aspect ratios do not match

CENTER

`<CENTER>` maintains native resolution of the input and centers the selected window within a display.

STRETCH

`<STRETCH>` stretches a window to fit onto the display without cropping when the aspect ratio of the input is different than that of the display device. The aspect ratio will not be maintained if the image is stretched.

ZOOMING AND PANNING WITHIN A WINDOW

The QDLS card output offers both pan and zoom functions. These functions let you focus on portions of an image and increase and decrease the zoom, and can be engaged using RS-232 or Telnet control.

Pan and Zoom

When using RS-232 or Telnet control, you have two types of pan/zoom controls. The first is a step pan or zoom, where you pan or zoom a percentage each time you issue the command. The second type of control is a continuous pan or zoom. This type of zoom is meant for use with a programmable external control device.

ZOOM

The WINZM Command

The standard winzm control lets you step zoom in or out within a selected window.

The command is:

WINZM <window #>

Where:

•<window #> is the number of the window (1-36) you would like to control.

When you issue this command, the following field appears to let you control the zoom action:

Zoom control: <+> zoom in, <-> zoom out, <q> quit



+ <---> -

Each time you press + or -, you zoom in or out a set percentage.

The ZOOM Command

With the Zoom command, you are able to interactively control the size of the window for the selected output. Once the window is large enough to completely fill the display screen, the interactive Zoom command's pan controls may be used to pan within the window.

ZOOM <window #>

VIDEO WINDOWING

Zooming and Panning Within a Window

A control field will appear that will allow you to interactively size the window to suit your needs and then pan within that window once it is as large as the entire display screen.

- Zooming in will enlarge the window.
- Zooming out will shrink the window.

PAN

With the PAN command, you can pan up, down, left, and right within a selected window.

NOTE: You must zoom into a window before panning.

The command is:

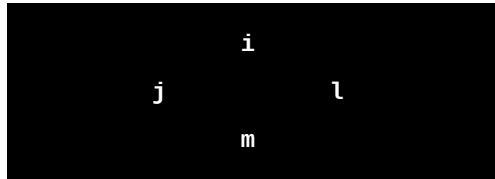
PAN <window #>

Where

- <window #> is the number of the window (1-36) you would like to control.

When you issue this command, the following field appears to let you control the pan action:

Pan control: i - up, m - down, j - left, l - right q - quit



Each time you press one of these letters, you pan in the selected direction by a set percentage.

CONTINUOUS PAN & ZOOM

In addition to the standard pan and zoom controls described above, there are special controls meant for use with a programmable external control device. The continuous pan and zoom controls let you continue an action until the STOP command is issued.

For details, see “Continuous Panning and Zooming a Window” on page 115, and “Continuous Window Position & Zoom” on page 116.

CROPPING

By issuing the RS-232/Telnet CROP commands, areas of a window may be interactively cropped, or cropped at a specific location and size. Cropping a window will replace the removed portion with background.

Cropping Interactively

The three steps involved in interactively cropping a window are listed below.

1. SELECT A WINDOW TO CONTROL

In order to crop a window, you must first select a window to control.

To select a window to crop, issue the command:

CROP <window #>

Where:

- <window #> is the number of the window (1-36) you would like to control.

After entering this command, the Crop control field will appear, as seen in *Figure 19*. You may then use this field to control the window you have selected.

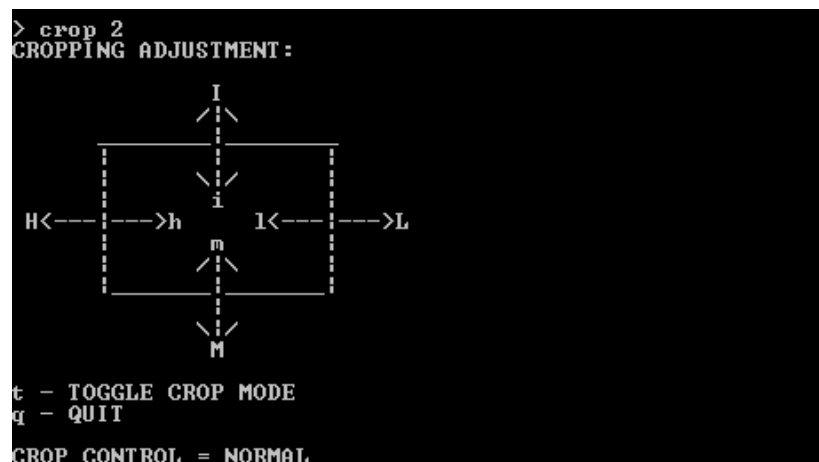


FIGURE 19. The Crop Control Field

VIDEO WINDOWING

Cropping

2. CHOOSE “CROP”

You must choose to crop the selected window using the Toggle Crop Mode key, the lower-case “t” key.

Pressing this key will change the Crop Control setting at the bottom of the control field to read “Normal” (as in *Figure 19*) or “Crop.” If Crop Control is set to “Normal,” no cropping action may be taken.

3. CROP THE SELECTED WINDOW

Once you have set Crop Control to “Crop,” you may then perform this action on a portion of the selected window using the Cropping Adjustment control keys.

All lower-case control keys (h, l, i, m) crop the chosen area of the window by one preset increment of pixels. To reverse this action, use the upper-case control keys. The upper-case control keys (H, L, I, M) decrease the cropped area by one increment, exposing the previously hidden portion of the window.

The table below explains the action each cropping adjustment control key can perform in this step.

Key	Action
h	Crops the left side of the window by one increment.
H	Decreases the left crop by one increment.
l	Crops the right side of the window by one increment.
L	Decreases the right crop by one increment.
i	Crops the top of the window by one increment.
I	Decreases the upper crop by one increment.
m	Crops the bottom of the window by one increment.
M	Decreases the lower crop by one increment.

Cropping at a Specific Location and Size

With multiple arguments, you can crop a window by providing the number of pixels you would like to remove from the sides, top, and bottom.

The command is:

```
CROP <window #> <left> <top> <right> <bottom> <cropmode>
```

Where:

- <window #> is the number of the window (1-36) you would like to control.

VIDEO WINDOWING

Cropping

- `<left>` and `<right>` crop in pixels.
- `<top>` and `<bottom>` crop in lines.
- Crop mode: 0=normal, 1=crop



VIDEO WINDOWING

Cropping

DISSOLVE AND FORCE EFFECTS

This chapter provides instructions for using two of the CXPS' special video effects- dissolve and force.

NOTE: This chapter is applicable to CXPS firmware version 4.00 and above.

ABOUT DISSOLVE AND FORCE

Overview

The CXPS video dissolve feature creates a transition in which one output's video fades into- and is gradually replaced by- the video of another. The dissolve rate may be adjusted, allowing for very gradual dissolves as well as transitions so immediate that they act as a video cut rather than a dissolve transition.

The CXPS video force feature fades one output's video only partially into the video of another. The visibility of the first output's video through the second can be adjusted to suit your needs. See Figure 21 on page 82 for an example of the Force effect.

Using the dissolve and force features, the user is able to dissolve or force from window to window or from output to output. A user may also dissolve or force from a window to its background- the windowing display screen. This will fade a window away, revealing the portion of the background that it had previously concealed.

The dissolve and force effects can be controlled using RS-232/Telnet commands.

CXPS Dissolve and Force Capabilities

The CXPS dissolve and force commands may only be used to dissolve or force between channels on the same card, as illustrated in *Figure 20*. For example, you may only dissolve from output channel 5 to other outputs on card B, channels 6, 7, and 8.

The SDO (Simultaneous Dissolve Outputs) command may be used to dissolve between multiple pairs of channels simultaneously. There is still a restriction that channels in a dissolve pair must be on the same card. However, the pairs of channels can be on different

DISSOLVE AND FORCE EFFECTS

Output Timing Synchronization

cards. For example, you may dissolve from channels 1 to any other channel on card A, and at the same time, dissolve from output 9 to any other channel on card C.

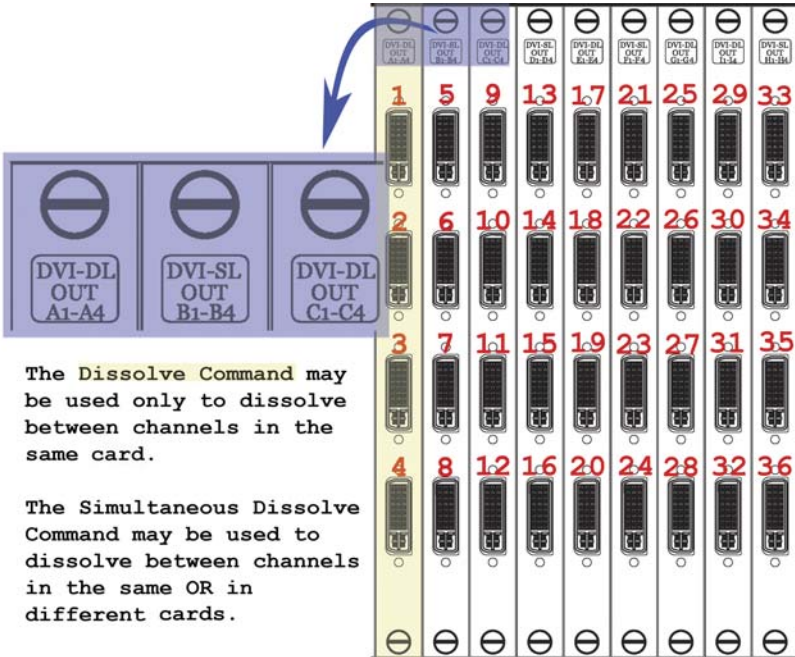


FIGURE 20. CXPS Dissolve Capabilities

OUTPUT TIMING SYNCHRONIZATION

NOTE: Output timing synchronization must be performed manually when using RS-232/Telnet control.

Before the dissolve or force functions are set up, the timing of each output channel that will be involved in the effect must be synchronized to the first output channel on that card. This includes the channel connected to the display, and also the channel you will be dissolving to or from.

This means that you will have to synchronize only one card when setting up a standard dissolve or force effect, or a simultaneous dissolve between channels that share the same card. However, if you plan to simultaneously dissolve between channels on different cards,

you will have to follow synchronization procedure several times- once for each card involved- before setting up the dissolve effect.

NOTE: If you will be forcing, dissolving, or simultaneously dissolving to black ONLY (not between any output channels), you do not need to synchronize output timings before setting up the dissolve or force effects.

There are two different procedures to follow when synchronizing output timing- one for when the output display screen used in the effect is connected to the first channel on the card, and one for when it is not.

When the Display is Connected to the First Channel on the Card:

OUTPUT TIMING SYNCHRONIZATION

Before setting up the dissolve or force effect, issue the Framesync command, which synchronizes the output timing of each output channel that will participate in the dissolve effect to that of the first output channel on that card.

The command is:

FRAMESYNC <master> <slave1>...<slave3>

Where:

- <master> is the first channel on the card, to which the display is connected.
- <slave1>...<slave3> are the other channels on the same card as <master> that you would like to use in the dissolve or force effect (the “before” video and the “after”)

EXAMPLE

Suppose you want to dissolve on output display 5, which is connected to output channel 5. This would mean that the display is connected to the first channel on the card, as shown in *Figure 20*. If you want to dissolve from output channel 6 to output channel 8 on display 5, you would first need to synchronize the output timing of output channels 6 and 8 to that of output channel 5. The command would be:

FRAMESYNC 5 6 8

When the Display is NOT Connected to the First Channel on the Card:

OUTPUT TIMING SYNCHRONIZATION

STEP 1: THE HOSTLIST COMMAND

Use the Hostlist command to find the number that represents the resolution of your chosen output display.

To display the host table, use the HOSTLIST command, which will produce a list of output timings for each display's resolution. Find the resolution of your chosen display screen, and use the corresponding number with the SETOT command in the next step.

STEP 2: THE SETOT COMMAND

Use the Set Output Timing command to set the output timing of the first output channel on the card to that of the display screen you plan to use.

The command is:

SETOT <output #> <host>

Where:

- <output #> is the number of the first output channel on the card.
- <host> is a number from the host table that represents the output timing of the display screen (see Step 1 for help finding this number).

STEP 3: THE FRAMESYNC COMMAND

Issue the Framesync command to synchronize the output timings of both channels involved in the effect and also of the channel connected to the display to the timing of the first output channel on that card.

The command is:

FRAMESYNC <master> <slave1>...<slave3>

•Where:

- <master> is the first channel on the card.
- <slave1>...<slave3> are the other channels on the same card as <master>, including the channel connected to the output display and both channels that will be involved in the dissolve/force effect. There are up to three slave channels possible.

EXAMPLE

Suppose you want set up the dissolve or force effect on output display 14, which is connected to channel 14. You have one window on this display, on channel 15. You would like to dissolve from channel 15 to channel 16 within this window.

Remember, the display's channel, channel 14, is the second channel on the card, as shown in *Figure 20*. Therefore, you would have to follow the three steps described earlier in this section.

STEP 1: Enter the command HOSTLIST and find the resolution of output display 14 on the host table. If output display 14 has a resolution of 1280x1024, the corresponding number for that resolution is: 5.

STEP 2: Set the output timing of the first output channel on the card, channel 13, to that of output display 14 using the SETOT command. The command would be: SETOT 13 5

STEP 3: Synchronize the output timings of channels 14 (the display), 15, and 16 with the first channel on that card, channel 13. The command would be: FRAMESYNC 13 14 15 16

DISSOLVE AND FORCE

The Dissolve RS-232/Telnet commands allow the user to dissolve or force one output or window, while the Simultaneous Dissolve Output (SDO) commands allow the user to dissolve several outputs or windows simultaneously. With these commands' capabilities, the user is able to dissolve or force from window to window or from output to output. A user may also dissolve or force from a window to its windowing output- this will fade a window away, revealing the portion of the background that it had previously concealed.

NOTE: Before setting up a dissolve or force effect, the timing of each output channel involved must be synchronized to the first output channel on that card. See "Output Timing Synchronization" on page 78.

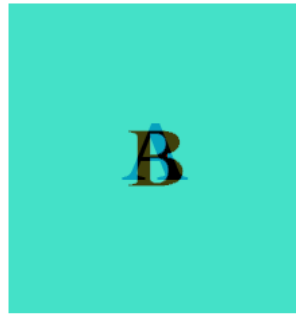
An example of the force effect can be seen in Figure 21 on page 82

DISSOLVE AND FORCE EFFECTS

Dissolve and Force



If Force is set up to partially fade from output channel A to output channel B, with a force % set to 25...



25% of the video on output channel A will be visible through the video on channel B.

FIGURE 21. The Force Effect

Dissolve and Force

The Dissolve commands allow the user to dissolve or force one window or output. The three steps involved are listed below.

STEP 1. SET UP WINDOWING IF DESIRED

If you would like to dissolve or force a window, you must set up windowing mode prior to setting up the dissolve effect.

You can choose to use either standard windowing mode or picture-in-picture mode. For instructions on setting up standard windowing, see “Output Timing Synchronization” on page 57 or see “Picture-In-Picture” on page 60 for help setting up picture-in-picture mode.

STEP 2. SET UP THE DISSOLVE OR FORCE EFFECT

To set up dissolve or force effect settings, use the command:

DISSETUP <output #> <from source> <type> <dissolve rate or force %>

Where:

- <output #> is the output or window whose video is gradually replaced by the video from <from source>.

It is a number 1-36 corresponding to the output channel connected to the window/output you would like to select.

- <from source> is the output or window whose video replaces the video from <output #>.

It is a number 1-36 corresponding to the output channel connected to the window/display you would like to select, or the number 100 if you would like to fade to black.

NOTE: When dissolving from a window to its background, <output #> and <from source> will both be the number of the channel connected to the chosen output display.

- <type> is either “dissolve” or “force”.

Selecting “force” will allow you to partially fade from <output #> to <from source>, while selecting “dissolve” will allow you to dissolve.

- <dissolve rate or force %> is the number of frames (1-1024) for the dissolve transition, or, if you choose to force, the percentage of <output #> visible through <from source>.

A dissolve rate of 1 will create an immediate “cut” transition rather than a dissolve.

STEP 3. DISSOLVE OR FORCE

To perform the dissolve or force effect, issue either the Dissolve or Dissolve FlipFlop command.

The Dissolve Command

There are two different arguments you can use when issuing the DIS command. The first, DIS <output #>, can be used to dissolve or fade between the channels in any dissolve pair. The second, DIS <output #> <delay rate> can only be used to dissolve (not force) between a window and the windowing display screen when they share the same output channel. Using this argument, the selected window will dissolve away, and then, after a set delay period, dissolve back into view.

DISSOLVE AND FORCE EFFECTS

Dissolve and Force

- DIS <output #>

Where:

<Output #> is identical to the output number specified in setup.

- When dissolving, issue this command again to dissolve from <from source> back to <output #>
- When forcing, issuing this command again will produce no effect.

See Figure 21 on page 82 for an example of the Force effect.

- DIS <output #> <delay rate>

Where:

<output #> is identical to the output number specified in setup.

<delay rate> is the number of frames (1-1024) for the delay.

NOTE: The delay rate feature can only be used when dissolving from a window to its background.

EXAMPLE:

In Dissolve Setup (Step 1), you set up a dissolve effect to dissolve Window 5 to reveal its background on Output display 7. You would like Window 5 to dissolve away, and after a delay of 60 frames, dissolve back into view. The command initiate the effect is:

DIS 7 60

The Dissolve FlipFlop Command

The DISFF Command can be used to dissolve (not force) between two output channels that are not under windowing mode. The full effect of this command will not be visible unless display screens are connected to both channels in the dissolve pair.

When the DISFF command is issued, the video from one display screen (Display screen A) will be gradually replaced by that from another display screen (Display Screen B). Once the dissolve is complete, the video that had appeared on Display screen A before the dissolve will be immediately switched to fill Display screen B.

DISFF <output #>

Where:

<output #> is identical to the output number specified in setup.

DISSOLVE AND FORCE EFFECTS

Dissolve and Force

- Issuing this command again will reverse the effect.

NOTE: The DISFF command can only be used when dissolving between two output channels that are NOT under windowing mode. These channels must be connected to display screens.

EXAMPLE:

In Dissolve Setup (Step 1), you set up a dissolve effect to dissolve from the video on Output display 1 to the video on Output display 2. Once the Dissolve is complete, you would like the video that had appeared on Output display 1 to immediately display on Output display 2. The command is

DISFF 1

TO DELETE DISSOLVE SETTINGS

To reset output parameters to default settings, use the command:

DISDEL <output #>

Where:

- <output #> is identical to the output number specified in setup.

Simultaneous Dissolve Output

The Simultaneous Dissolve Output (SDO) commands allow users to simultaneously dissolve multiple groups of windows or outputs by storing output-source pairs in ten different preset slots. A user may also dissolve from multiple windows to their backgrounds- this will fade the chosen windows away, revealing the portions of the background that had previously obstructed.

The maximum number of dissolve pairs is equal to the maximum channels installed. The steps needed to simultaneously dissolve are listed below.

NOTE: Before setting up the simultaneous dissolve effect, the timing of each output channel involved must be synchronized to the first output channel on that card. See “Output Timing Synchronization” on page 78.

If you plan to simultaneously dissolve between channels on different cards, you will have to follow synchronization procedure several times- once for each card involved, before setting up the dissolve effect.

STEP 1. SET UP WINDOWING IF DESIRED

If you would like to simultaneously dissolve windows, you must set up windowing mode prior to setting up the simultaneous dissolve effect.

DISSOLVE AND FORCE EFFECTS

Dissolve and Force

See “Standard Window Function” on page 59 or “Picture-In-Picture” on page 60 for instructions on setting up standard windowing or picture-in-picture modes.

EXAMPLE

Set Output 2 to display as a window in the foregrounds of Outputs 1 and 3 by issuing the picture-in-picture commands:

```
PIPON 1 2 1
```

```
PIPON 3 2 3
```

Then set Output 8 to display as a window in the foregrounds of Outputs 5 and 6 by issuing the commands:

```
PIPON 5 8 5
```

```
PIPON 6 8 6
```

STEP 2. SET SIMULTANEOUS DISSOLVE PAIRS

To set up simultaneous dissolve settings, use the command:

```
SD0 <preset #> <dissolve rate> <output #> <from source> ...  
<output #> <from source>
```

Where:

- **<preset #>** refers to the preset slot (1-10) to which you would like to store dissolve pairs.
- **<output #> <from source>** represents a dissolve pair.
- **<output #>** is the output or window whose video is gradually replaced by the video from **<from source>**.

It is a number 1-36 corresponding to the output channel connected to the window/output you would like to select.

- **<from source>** is the output or window whose video replaces the video from **<output #>**.

It is a number 1-36 corresponding to the output channel connected to the window/display you would like to select, or the number 100 to dissolve to black.

NOTE: When dissolving from a window to its background, **<output #>** and **<from source>** will both be the number of the channel connected to the chosen output display.

- **<dissolve rate>** is the number of frames (1-1024) for the dissolve effect.

Choosing a dissolve rate of 1 will create a quick video “cut” transition, rather than a more gradual video dissolve transition.

EXAMPLE

After setting up picture-in-picture mode in the previous example, and choosing the dissolve rate of 120, the command is:

```
SDO 1 120 1 3 5 6
```

This sets preset 1 to trigger output 1 to dissolve into output 3, and output 5 to dissolve into output 6 at a rate of 120.

STEP 3. DISSOLVE

To perform the simultaneous dissolve effect, issue the command:

```
SDORUN <preset #>
```

EXAMPLE

According to the setup of the previous two steps’ examples, the command is:

```
SDORUN 1
```

TO DELETE SIMULTANEOUS DISSOLVE SETTINGS

To remove a particular preset number’s simultaneous dissolve settings, issue the command:

```
SDODEL <preset #>
```



DISSOLVE AND FORCE EFFECTS

Dissolve and Force

WALL PROCESSING

ABOUT WALL PROCESSING

The CXPS can route any input source to several output displays, which work together in unison to create one very large display, or “wall,” as shown in *Figure 22*.

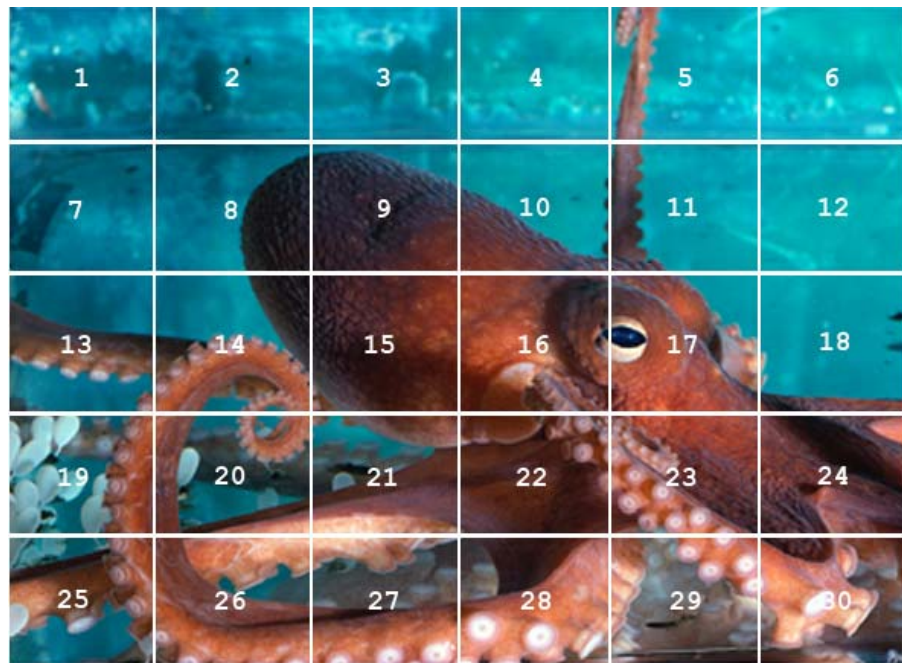


FIGURE 22. Wall Display Example

WALL DISPLAY OUTPUT ARRANGEMENT

The output displays in the wall should be organized from left to right by channel number into equally-sized rows, as demonstrated in *Figure 22*.

OUTPUT TIMING SYNCHRONIZATION

Overview

The output timings of every output display in the wall must be the same. Before wall function is enabled, the timing of each output in the wall must be synchronized to the timing of the first output in the wall using RS-232/Telnet commands.

Setting the Output Timing:

You may set the output timing of the first output in your wall (the display in the upper left hand corner of your wall), and then synchronize all other outputs to this new timing. If you are satisfied with the current output timing of the first output in your wall, proceed to the next section, “Synchronizing Output Timings” on page 90.

To set the output timing of your first display, follow these 2 steps:

STEP 1: THE HOSTLIST COMMAND

Use the Hostlist command to find the number that represents the resolution of your output displays.

To display the host table, use the HOSTLIST command, which will produce a list of output timings for each display’s resolution. Find the resolution of your chosen displays, and use the corresponding number with the SETOT command in the next step.

STEP 2: THE SETOT COMMAND

Use the Set Output Timing command to set the output timing of the first output channel used in the wall to that of the display screens you plan to use.

The command is:

```
SETOT <first output #> <host>
```

Where:

- <first output #> is the number of the first output channel used in the wall.
- <host> is a number from the host table that represents the output timing of the display screens (see Step 1 for help finding this number)

Proceed to “Synchronizing Output Timings” to complete output synchronization.

Synchronizing Output Timings

Before wall function is enabled, the timing of each output in the wall must be synchronized to the timing of the first output in the wall using the Framesync or GFramesync command.

THE FRAMESYNC COMMAND

Use the Framesync command to specify every channel you would like to synchronize to the first output. The command is:

```
FRAMESYNC <first output #> <slave1>...<slave35>
```

Where:

- <first output #> is the first output channel used in your wall.
- <slave1>...<slave35> are the other output channels used in your wall, with a total of up to 35 slave channels possible (if your CXPS has 36 outputs).

- **Example:**

Suppose you want to create a 2x3 wall using displays connected to output channels 2, 3, 4, 9, 10, and 11. You must synchronize the timings of output channels 3, 4, 9, 10, and 11 with that of output channel 2, the first output in the wall. The command would be:

```
FRAMESYNC 2 3 4 9 10 11
```

THE GFRAMESYNC COMMAND

You may use the GFRAMESYNC command to synchronize the timings of a range of outputs to the timing of the first output in the range. The command is:

```
GFRAMESYNC <first output #> <last output #>
```

Where:

- <first output #> is the first output channel used in your wall (and the first output in the range).
- <last output #> is the last output channel in the range.

- **Example:**

Suppose you want to create a 2x3 wall using output displays connected to channels 1 through 6. You would need to synchronize the output timings of channels 2 through 6 with that of output 1. The command would be:

```
GFRAMESYNC 1 6
```

WALL PROCESSING FUNCTION

The CXPS can support multiple walls. Each wall is identified by its first output number.

Enabling Wall Processing Function

WHEN THE OUTPUTS USED ARE IN A RANGE

To turn the wall processing on when the outputs used by your wall are in a range, issue the command:

```
WALL <input#> <first output#> <column> <row> ON
```

Where:

- <input #> is the input you would like to route to the wall display.
- <first output#> is the channel number of the first output display in the wall.
(the display located at the upper left-hand corner of the wall).
- <column> and <row> specify the size of the wall:
 <column> is the number of output displays wide.
 <row> is the number of output displays high.

For example, to create the wall shown in *Figure 22* and route input 3 to it, the command would be:

```
WALL 3 1 6 5 ON
```

WHEN THE OUTPUTS USED ARE NOT IN A RANGE

If you skipped outputs when making your wall, like the wall in *Figure 23*, you will need to specify the outputs used when enabling wall function. Enable wall function by issuing the command:

```
WALL <input#> <first output#> <column> <row> <output #> ...  
<output #> ON
```

Where:

- <input #> is the input you would like to route to the wall display.
- <first output#> is the channel number of the first output display in the wall.
(the display located at the upper left-hand corner of the wall).
- <column> and <row> specify the size of the wall:
 <column> is the number of output displays wide.
 <row> is the number of output displays high.

- <output #> ... <output #> are the channel numbers other than <first output#> that are used in the wall. They should be listed in order from left to right, top to bottom.

For example, to create the 4x4 wall shown in *Figure 23* and route input 13 to it, you would issue the command:

```
WALL 13 1 4 2 3 4 5 6 7 8 29 30 31 32 33 34 35 36 ON
```

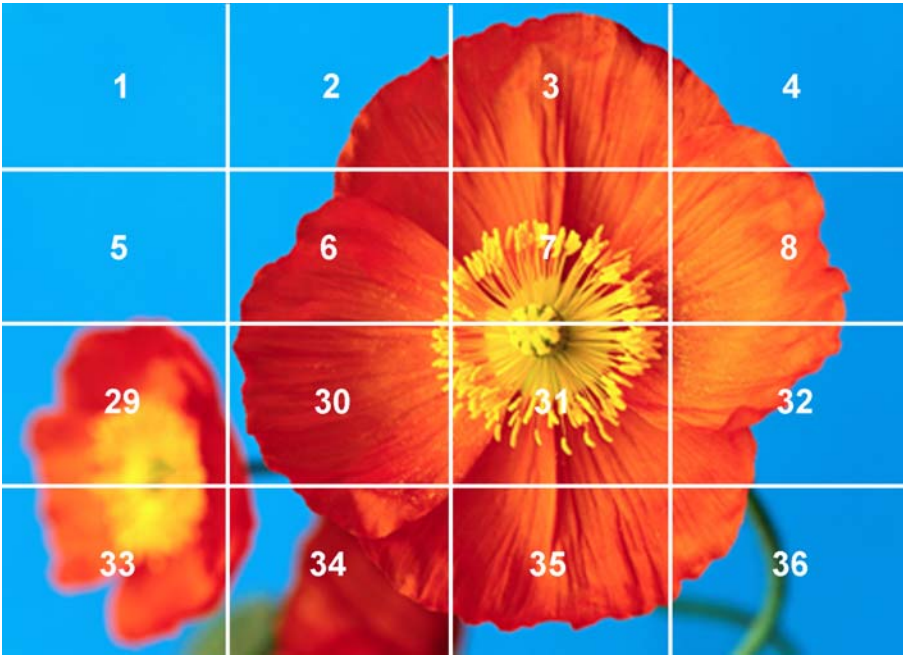


FIGURE 23. 4x4 Wall

Disabling Wall Processing Function

To turn wall processing function off, issue the command:

```
WALL <first output #> OFF
```

ADJUSTING WALL POSITION

To interactively adjust the position of the wall, issue the command:

```
WALLADJ <first output #>
```

WALL PROCESSING

Switching Input Sources

This will cause the wall adjustment control field to appear, as shown in *Figure 24*.

```
> walladj 1
Wall Position adjustment:

    i
j      l
    m

q - quit

Speed control: f - fast; s - slow
speed = 1 pixels
```

FIGURE 24. The Wall Adjustment Control Field

Wall Position Adjustment Control:

- To move the wall's position to the left one preset increment, press the lower-case "j" key.
- To move the wall's position to the right one preset increment, press the lower-case "l" key.
- To move the wall's position up one preset increment, press the lower-case "i" key.
- To move the wall's position down one preset increment, press the lower-case "m" key.

Speed Control:

- To increase the adjustment speed, press the lower-case "f" key.
- To decrease adjustment speed, press the lower-case "s" key.
- Each time the "f" or "s" key is pressed, the speed is adjusted by 1 preset increment of pixels.

SWITCHING INPUT SOURCES

The input source routed to a wall can be switched using the RS-232/Telnet Wall Switch command. When selecting a different input to display on the wall outputs, issue the command:

```
WALLSW <input #> <first output #>
```

Where:

- `<input #>` is the number of the input you would like to route to the wall.
- `<first output #>` is the first output number in the wall (the display in the upper lefthand corner).



WALL PROCESSING

Switching Input Sources

RS-232 AND 10/100T PROTOCOL

CXPS COMMAND SET

The CXPS is controlled by using RS-232 or Ethernet connection using telnet protocol. Commonly used commands are presented and defined in the following tables covering scaling, switching, general system commands, wall processing, and windowing.

FIRMWARE VERSION

These commands are compatible with firmware version 5.62 and above.

DISSOLVE AND FORCE COMMANDS

Command	Syntax	Action
CLEAREFFECT	CLREFFECT	Clears all effects in memory, including SSO, SDO, WINDOW, WALL, and DISSOLVE.
DISSETUP	DISSETUP <output #> <from source> <type> <dissolve rate or force %>	Sets up dissolve effect. <output #> is the output or window whose video is gradually replaced by the video from <from source>. <output #> is the number (1-36) of the output channel connected to the window/output you would like to select. <from source> is the number (1-36) of the output channel connected to the window/output you would like to select, or the number 100 for black. <type> is either “dissolve” or “force” <dissolve rate or force %> is the number of frames (1-1024) for the dissolve transition or the percentage of <output #> visible through <from source> for the force effect. NOTE: When dissolving from a window to its background, <output #> and <from source> will both be the number of the channel connected to the chosen output display.
DIS	DIS <output #>	Performs the dissolve effect. <output #> must be the same as in setup.
	DIS <output #> <delay rate>	Performs the dissolve effect. <output #> must be the same as in setup. <delay rate> is the number of frames for the delay (1-1024). NOTE: The delay rate feature can only be used when dissolving from a window to its background.

DISSOLVE AND FORCE COMMANDS

Command	Syntax	Action
DISDEL	DISDEL <output #>	Removes dissolve settings, resetting the output parameters to defaults.
DISFF	DISFF <output #>	Special Command. Performs the Dissolve FlipFlop effect: after the dissolve effect is completed, the original content of the output will be switched to the source output. <output #> must be the same as in setup. NOTE: The DISFF command can only be used when dissolving between two output channels that are NOT under windowing mode. These channels must be connected to display screens.
SDO	SDO <preset #> <dissolve rate> <output #> <from source> ... <output #> <from source>	Sets up the simultaneous dissolve output window pairs. <preset #> refers to the preset slot (1-32) to which you would like to store the dissolve pairs. <output #> is the output or window whose video is gradually replaced by the video from <from source>. <output #> is the number (1-36) of the output channel connected to the window/output you would like to select. <from source> is the number (1-36) of the output channel connected to the window/output you would like to select, or the number 100 for black. <dissolve rate> is the number of frames (1-1024) for the dissolve transition.
SDODEL	SDODEL <preset #>	Removes simultaneous dissolve settings.
SDORUN	SDORUN <preset #>	Performs the simultaneous dissolve effect using the preset window pairs.

SCALING COMMANDS

Command	Syntax	Action
CKOFF	CKOFF <output #>	Turns off chromakeying.
CKON	CKON <output #> <fg> <bg> <red-lo> <green-lo> <blue-lo> <red-hi> <green-hi> <blue-hi>	Turns on chromakeying and selects the color within the specified range of RGB key values.
DBUFFER	DBUF <output #> <threshold>	Changes the double buffer threshold value.e
FREEZE	FZ <output #> <ON OFF>	Freezes selected output.
GAMMA	GAMMA <output #> <value>	Changes the gamma of the selected output channel. <gamma> is a value from 10-250. 10 is equal to gamma 0.1 and 250 is equal to gamma 2.5. Default = 100, which equals gamma 1.0.

SCALING COMMANDS

Command	Syntax	Action
	GAMMA <red green blue> <output #> <value>	Adjusts the gamma of an individual color at the output.
GENLOCK	GL <output #> <ON OFF>	Genlocks the output timing to the associated input timing.
GENLOCKALL	GLALL <ON OFF>	Genlocks the output timing of all outputs to the associated input timing.
OUTPUTWINDOWSIZE	OWS <output #> <FIT FILL CENTER STRETCH>	Applies preset video positioning to the specified output channel. <FIT> fits the entire image onto the display, maintaining the original aspect ration. Equivalent to resetting the video scaling to the default auto-resolution display. <FILL> scales an image up or down to fill the display, maintaining proper aspect ratio of the input. Image will be cropped if the input and output aspect ratios do not match <CENTER> maintains native resolution of the input and centers it within a display with a different resolution. <STRETCH> stretched an image to fit onto the display without cropping when the aspect ratio of the input is different than that of the display device. The aspect ratio will not be maintained if the image is stretched.
	OWS <output #> <hsize> <vsize>	Specifies a custom output resolution for the specified output channel. Aspect ratio is not constrained.
PAN	PAN <output #>	Activates controls to pan around the active boundary of zoomed video of the selected output or window. Control pan action with: i - up, m - down, j - left, l - right q - quit
PIWS	PIWS <output #>	Special command. Retrieves the source window and destination window values from the NVRAM.
PIWSALL	PIWSALL <output #>	Special command. Retrieves the source window and destination window values from the NVRAM for all outputs only if the outputs all share the same input.
RSTDBUFFER	RSTDBUF <output #>	Resets the double buffer threshold to the factory default value.
RSTOUTPUTATTR	RSTOUTPUTATTR	Resets the output gamma, lower, upper, brightness, and contrast to the default values. When using firmware version 4.85 or previous, issue the RFD command and then this command after installing a new board or updating firmware.
SFREEZE	SFZ <output #> <output #> ... <output #> <ON OFF>	Simultaneously freezes or unfreezes multiple outputs.

SCALING COMMANDS

Command	Syntax	Action
SQUAREPIXEL	SPXL <output #> <ON OFF>	Switches between ITU601 and square pixel for NTSC and PAL signals.
UHD	UHD <output #> <ON OFF>	Turns ultra high-definition (UHD) processing on or off. UHD refers to 4Kx4K processing.
UHDZOOM	UHDZM <output #>	Zooms and pans the UHD output interactively.
	UHDZM <output #> <zi zo pl pr pu pd stop> <speed>	Zooms the UHD output. zi = zoom in, zo = zoom out, pl = pan left, pr = pan right, pu = pan up, pd = pan down, stop= stop the process. Speed is 1 to 10.
ZOOM	Zoom <output #>	Activates zoom control for the selected output channel or window. Control zoom action with: <+> zoom in <-> zoom out
	ZOOM <output #> <action> <speed>	This type of pan and zoom is meant for use with a programmable external control device. Run the command in background mode. This command will run until it reaches the limit or receives a stop instruction. <output #> is the number of the output channel connected to the output display or window you want to control. <action> is one of the following: zi- zoom in, zo- zoom out, pu- pan up, pd- pan down, pl- pan left, pr- pan right, STOP. <speed> is a value from 1 - 10 and sets the speed of the action.
ZOOM2	ZM2 <output #><output #>	Activates zoom control for two output channels simultaneously. NOTE: The two outputs channels must be routed to the same input.
	ZM2 <output #> <output #> <zi zo pl pr pu pd stop> <speed>	Zooms or pans 2 output channels simultaneously. zi = zoom in, zo = zoom out, pl = pan left, pr = pan right, pu = pan up, pd = pan down, stop= stop the process. Speed is 1 to 10. NOTE: The two outputs channels must be routed to the same input.
ZOOM3	ZM3 <output #> <output #> <output #>	Activates zoom control for 3 outputs simultaneously. NOTE: The 3 output channels must be routed to the same input.

SCALING COMMANDS

Command	Syntax	Action
	ZM3 <output #> <output #> <output #> <zi zo pl pr pu pd stop> <speed>	Zooms or pans 3 outputs simultaneously. zi = zoom in, zo = zoom out, pl = pan left, pr = pan right, pu = pan up, pd = pan down, stop= stop the process. Speed is 1 to 10. NOTE: The 3 outputs channels must be routed to the same input. For firmware version 4.80 and above.

SWITCHING COMMANDS

Command	Syntax	Action
BRIGHTNESS	BRI <input #> <bright>	Adjusts the brightness of the input signal. RGB and SD inputs only. <bright> is a value from -100 to 100.
CLEAREFFECT	CLREFFECT	Clears all effects in memory, including SSO, SDO, WINDOW, WALL, and DISSOLVE.
CONTRAST	CONT <input #> <contrast>	Adjusts the contrast of the input signal. RGB and SD inputs only. <contrast> is a value from 0 to 200.
COPYOUTPUTTIMING	CPOT <from> <to>	Copies output timing from one output to the other. <from> is the number of the output whose timing you are copying. <to> if the number of the output who will be receiving the copied output timing.
CREATEINPUTHOST	CINHOST <slot #> <name> <hfp> <hs> <hbp> <hact> <vfp> <vs> <vbp> <vact> <hfreq> <sync> <phase> <vpol> <hpol> <interlace>	Creates an input host timing in the designated slot number (1-40), with the specified parameters. <slot #> is a number 1-40. <name> is limited to 16 characters. <hfreq> in Hz. <sync> is 3,4, or 5 wire. <vpol> is vertical sync polarity; 1 = positive, 0 = negative. <hpol> is horizontal sync polarity. <interlace> is 1 = interlaced, 0 = non-interlaced.

SWITCHING COMMANDS

Command	Syntax	Action
CREATEOUTPUTHOST	COUTHOST <slot #> <name> <hfp> <hs> <hbp> <hact> <vfp> <vs> <vbp> <vact> <hfreq> <sync> <phase> <vpol> <hpol> <interlace>	Creates an output host timing in the designated slot number, with the specified parameters. <slot#> is a value from 501 to 540. <name> is limited to 16 characters. <hfreq> in Hz. <sync> is 3,4, or 5 wire. <vpol> is vertical sync polarity; 1 = positive, 0 = negative. <hpol> is horizontal sync polarity. <interlace> is 1 = interlaced, 0 = non-interlaced.
HOSTLIST	HLIST	Lists the host timing table.
HOSTMATCH	HM <input #>	Lists the default hosts that match the input timing. RGB inputs only.
HUE	HUE <input #> <hue>	Adjusts the hue of the input signal. SD inputs only. <hue> is a value from -180 to 180.
INPUTFORMAT	INFMT <input #> <format>	Changes the input format of the selected channel. <format> can be composite, s-video, or component.
INPUTLIST	INLIST	Lists the user timing table.
INPUTLISTDEL	INLISTDEL <user slot #>	Deletes the timing in the user timing table at the selected slot.
INPUTMODULUS	INMOD <input #>	Adjusts the modulus of the input signal. RGB inputs only.
INPUTNAME	INN <input #> <name>	Creates a name for the input signal. RGB inputs only.
INPUTPHASE	INPH <input #>	Adjusts the phase of the input signal. RGB inputs only.
INPUTPOSITION	INPOS <input #>	Adjusts the position of the input signal. RGB inputs only.
INPUTSAVE	INS <input #> <user slot #>	Saves the input timing to the user timing table. RGB inputs only.
INSTATUS	INSTATUS <input #>	Verifies whether there is a valid signal applied to the input. 1 indicates a valid signal. 0 indicates there is no signal on the input.
INPUTTIMING	INT <input #>	Shows the input timing.
LOWER	LOWER <output #> <+/- 100>	Adjusts the lower level of the input mapped to the specified output channel.
	LOWER <red green blue> <output #> <+/- 100>	Adjusts the lower level of the chosen color at the output.

SWITCHING COMMANDS

Command	Syntax	Action
MSW	MSW <input #> <output #>...<output #>	Special command. Switches the input to multiple outputs. NOTE: For firmware version 4.80 and above.
OUTBRI	OUTBRI <output #> <+/1 100>	Adjusts the brightness of the output.
OUTCONT	OUTCONT <output #> <0-200>	Adjusts the contrast of the output.
OUTPUTLIST	OUTLIST	Lists the output custom host timing table.
OUTPUTLISTDEL	OUTLISTDEL <slot #>	Deletes the output custom host timing at the specified slot.
OUTPUTSTATUS	OSTAT <output #>	Returns the input number connected to the output.
OUTPUTSTATUSALL	OSTATALL	Returns all of the input/output switching assignments.
OUTT	OUTT <output #>	Displays the output timing of the selected output channel.
PROFILEDELETE	PD <profile #>	Deletes the chosen profile.
PROFILERECALL	PR <profile #>	Sets up the input/output configuration from a stored profile.
PROFILESAVE	PS <profile #>	Saves the current input/output configuration as a profile, with up to 10 profiles possible. <profile #> can be any number 1-10.
SATURATION	SAT <input #> <sat>	Adjusts the saturation of the input signal. SD inputs only. <sat> is a value from 0 to 200.
SETINPUTTIMING	SETIT <input #> <host>	Assigns a default host timing to the input. The Vtotal, Hperiod, and interlace mode of the host must match the input source. <host> is a number which refers to the built in host table. Use the command HOSTLIST to display the host table
SETOUTPUTTIMING	SETOT <output #> <host>	Assigns a default host timing to the output. <host> is a number which refers to the built in host table. To display the host table, use the HOSTLIST command.
SSO	SSO <preset#> <input> <output> <input> <output> <input> <output>	Simultaneous Switching Outputs command allows user to store switching pairs in 32 different slots. The maximum number of I/O pairs is eighteen.
SSODEL	SSODEL <preset#>	To delete the SSO setup.
SSORUN	SSORUN <preset#>	To simultaneously switch outputs using the preset input-output pairs.

SWITCHING COMMANDS

Command	Syntax	Action
SWITCH	SW <input #> <output #>	Routes the input to the output. An input can be routed to more than one output.
SWITCHBO	SWBO <output #>	Blanks the specified output. This output will be unblanked automatically when an active input is switched to it. NOTE: For firmware version 4.80 and above.
UPPER	UPPER <output #> <0-200>	Adjusts the upper level of the input mapped to the specified output channel.
	UPPER <red green blue> <output #> <0-200>	Adjusts the upper level of the chosen color at the output.
USB	USB <mode>	<mode> is “lock” or “free”. When in lock mode, USB switch will follow the video switch assignment (e.g. sw 1 2 will also switch USB 1 to 2). In free mode, USB switch will not follow the video switch assignment, and the user must issue the USBSW command to perform USB switching.
USBSTATUS	USBSTAT	Displays the USB I/O connections and also the USB mode selected.
USBSWITCH	USBW <usb input #> <usb output #>	Performs USB switching.
VIDEOFORMAT	VFMT <input #>	Returns the video format of the specified input channel.
YUV	YUV <output #> <ON OFF>	Turns YUV support on or off.

SYSTEM COMMANDS

Command	Syntax	Action
BAUD	BAUD <9600 1920 38400 57600 115200>	Changes the baud rate of the RS-232 communication.
BLANKALLOUTPUT	BAO	Blanks all output channels.
BLANKOUTPUT	BO <output #>	Blanks the selected output channel.
COPYEDID	CPEDID <output #> <input #>	Copies the EDID from the display device to the input. NOTE: Before issuing this command, disconnect the input from the source.
COPYEDIDTIMING	CPET <output #> <slot #>	Copies output timing from the output to the output host slot, assuming the output timing is created from EDID information.
COPYINEDID	CPINEDID <input#> <output #>	Copies the input’s EDID to the output and programs the display device connected to that output with the input’s EDID information.

SYSTEM COMMANDS

Command	Syntax	Action
CSM	CSM	Creates the startup macro. Issue this command, then issue every command you would like stored in the macro. When finished, press Esc and then carriage return to end the session.
CUSTOMEDID	CEDID <input #> <host> <hsize> <vsize>	Sets the EDID timing from the host table. <hsize> and <vsize> values are compared to the resolution of the hosts in the host table. When the first match is found, the timing of that host is used to calculate the EDID value, which is then programmed to the input channel. NOTE: Before issuing this command, disconnect the input from the source.
	CEDID <input #> <host #>	Sets the EDID timing from the host table. Use when you know the host number.
DSM	DSM	Deletes the startup macro.
EXTCTL	EXTCTL <ON OFF>	Enables/disables a special protocol for using an external controller, such as Crestron or AMX to control the CXPS.
FORCEOUTPUT	FOUT <output #> <ON OFF>	Forces the specified output channel to send out a signal even when the CXPS cannot detect a connected display device. NOTE: If a monitor is connected to the CXPS via a fiber cable, there will be no hot plug, and thus the output will be undetected by the CXPS. To combat this issue, use the FOUT command to force output detection.
FORCEOUTPUTALL	FOUTALL <ON OFF>	Forces all the output channels to send out a signal even when the CXPS cannot detect the connected display devices. NOTE: For firmware version 4.80 and above.
FRAMESYNC	FRAMESYNC <master> <slave1>...<slave3>	Frame-synchronizes all the slave channels to the master channel.
GET8051	G8051 <input #>	Reads back the RGB to DVI converter timing of the selected input channel.
GETDVIINTIMING	GDIT <input #>	Returns the input DVI timing at the specified channel.
GETDVIOUTTIMING	GDOT <output #>	Returns the output DVI timing at the specified channel.
GETEDID	GEDID <output #>	Returns the EDID data from the display device connected to the selected output channel.
GETEXTREME	GEX <output #>	Reads back the ID of the Extreme Cable Conditioner at the selected output channel.
GFRAMESYNC	GFRAMESYNC <start output #> <end output #>	Synchronizes the frames of all outputs within the range of <start output #><end output #> to the start output.

SYSTEM COMMANDS

Command	Syntax	Action
HELP	H	Lists all user commands.
HOSTLIST	HLIST	Lists the host timing table.
ID	ID	Returns system information.
INPUTAUTOPOWER	INAUTOP <input #> <ON OFF>	Powers a converter connected to the CXPS. This command should be used the first time the converter is connected to the CXPS; the converter will thereafter be powered automatically upon connection.
INPUTAUTOSENSE	INAS <input #> <ON OFF>	Turns the SD input auto sensing on or off. When autosense is ON, the unit attempts to automatically identify the format of the input signal (component, svideo, or composite). When autosense is OFF, the format of the input signal must be set using the INPUTFORMAT command. Default = ON.
INTESTPATTERN	INTP <input #> <host> <pattern>	Turns on the test pattern <pattern> with host <host> from the input RGB converter. The converter generates an RGB host signal internally. To turn the test pattern generator off, issue the command <code>intp F <host></code>. Although it is required, the <host> setting is ignored. Test patterns <pattern>: 0 color bars 1 grey ramp 2 red ramp 3 green ramp 4 blue ramp 5 grey 64 steps 6 red 64 steps 7 green 64 steps 8 blue 64 steps 9 Auto Calibration - F Turns the test pattern generator off Output modes <host>: 0 800x600 1 1024x768 2 1280x1024 3 1600x1200 4 1920x1080 5 1920x1200
IPADDRESS	IPADDR <ip address>	Sets the static IP address for network use.
IPGATEWAY	IPGW <ip gateway>	Sets the network gateway.
IPNETMASK	IPNM <net mask>	Sets the network mask.

SYSTEM COMMANDS

Command	Syntax	Action
NEWEDID	NEDID <INPUT #> <hfp> <hs> <hbp> <hact> <vfp> <vs> <vbp> <vact> <hfreq> <sync> <phase> <vpol> <hpol> <interlace>	Creates a special EDID timing for the designated input, with the specified parameters. <hfreq> in Hz. <sync> is 3,4, or 5 wire. <vpol> is vertical sync polarity; 1 = positive, 0 = negative. <hpol> is horizontal sync polarity. <interlace> is 1 = interlaced, 0 = non-interlaced. NOTE: Before issuing this command, disconnect the input from the source.
OUTPUTPOWER	OUTP <output #> <ON OFF>	Turns the output's phantom power on or off.
PROGALLEDID	PROGALLEDID <DL SL>	Programs all inputs with the factory-default dual-link or single-link EDID value.
PROGEDID	PROGEDID <input #> <DL SL>	Programs the default dual link or single link EDID value to the selected input channel. NOTE: Before issuing this command, disconnect the input from the source.
PROGJUPEDID	PROGJUPEDID <input #>	Allows you to program the Cyviz-xpo3 50 Hz EDID data to the specified input of the CXPS. NOTE: Before issuing this command, disconnect the input from the source.
PROGSRXEDID	PROGSRXEDID <input #>	Allows you to program the SONY SRX projector's EDID data to the specified input of the CXPS. NOTE: Before issuing this command, disconnect the input from the source.
PROGXPOEDID	PROGXPOEDID <input #>	Allows you to program the Cyviz-xpo3 EDID data to the specified input of the CXPS. NOTE: Before issuing this command, disconnect the input from the source.
RDINEDID	RDINEDID <input #>	Returns the EDID data on the selected input channel. NOTE: Before issuing this command, disconnect the input from the source.
REMAP	REMAP <ON OFF>	Turns renumbering of I/O cards ON or OFF. When ON, remap will automatically adjust the numbering of all input and output channels to be in consecutive order. If a card is added or removed, the channel numbers will adjust to accommodate the addition. When remap is OFF, input and output channel numbers will be determined by the slot their card occupies, and I/O channel numbers will not be readjusted if cards are added or removed. Default is ON.
RESET	RST	Initiates a system reset of the CXPS.

SYSTEM COMMANDS

Command	Syntax	Action
RESETNETPASSWORD	RSTNPW	Resets the network password to default. Default = blackdiamond External control must be turned off before this command is issued. The system should be rebooted after this command is issued. IMPORTANT: This command requires assistance from Black Diamond Video technical support.
RESETOUTPUTTIMING	RSTOT <output #>	Resets the output timing according to the EDID information from the display device. If no EDID information is available, host #5 is used (1280x1024).
RESTOREDEFAULT	RFD	Restores the factory defaults for user parameters When using firmware version 4.85 or previous, issue this command after installing a new board or updating firmware, followed by the rstoutputattr command.
RSM	RSM	Runs the startup macro manually. After the Phantom 800 is powered on, the macro will run automatically.
SECURITY	SECURITY <ON OFF>	Turns the password requirement for the GUI connection on or off.
SETID	SETID -model <model name> -serial <serial #> -date <date> -password BDVid	Sets the system's ID.
SETNETPASSWORD	SETNPW	Sets the network password. Default = blackdiamond
SETUSB	SETUSB <1 2> -password BDVid	Tells the system how many USB boards are in the system.
SHOWNETWORK	SHOWNET	Shows the network setup parameters.
SOFTDEINTERLACER	SDI <output #> <ON OFF>	Turns the soft deinterlacer ON or OFF for the specified output channel. Default = ON.
UNBLANKALLOUTPUT	UBAO	Unblanks all output channels.
UNBLANKOUTPUT	UBO <output #>	Unblanks the selected output channel.
UPDATEFIRMWARE	UFW	Initiates a firmware update.
VERSION	VER	Returns the firmware version of the system.
VSM	VSM	Shows the content of the startup macro.

WALL PROCESSING COMMANDS

Command	Syntax	Action
CLEARFFECT	CLREFFECT	Clears all effects in memory, including SSO, SDO, WINDOW, WALL, and DISSOLVE.
EDGEBLEND	EB <output #> <H value> <V value>	Sets the edgeblending value on a wall output.
MULLION	MUL <# of pixels>	Compensates for the width of mullion in wall processing.
PMEDGEBLEND	PMEB <H value> <V value>	Allows the user to set the edge blending value on a PMWALL output.
PMMULLION	PMMUL <# of pixels>	Compensates for the width of the mullion in pixel-mapped wall processing.
PMWALL	PMWALL <# of windows> <column> <row> ON	To turn on pixel-mapped wall processing. <# of windows> is the number of windows in the wall.
	PMWALL OFF	Turns off pixel-mapped wall processing.
GROUP	GRP <group> <output #> <output #> <output #> <output #>	Sets four outputs to feed to the quad display as a group. The gamma, contrast, and brightness on outputs in this group will track on each other if the I/O pairs are the same.
GROUPDELETE	GRPDEL <group>	Deletes the specified group.
GROUPSTATUS	GRPSTAT	Displays the status of the groups.
WALL	WALL <input#> <first output#> <column> <row> ON	Turns the wall processing on. The CXPS can support multiple groups of walls. Each group is identified by its first output number. <column> and <row> specify the size of the wall. NOTE: The output channels used by the wall must be in consecutive order -- you may not skip a channel when creating a wall.
	WALL <input #> <first output #> <column> <row> <output #>...<output #> ON	Turns the wall processing on. The CXPS can support multiple groups of walls. Each group is identified by its first output number. <column> and <row> specify the size of the wall. NOTE: With this command, output channels used by the wall do not need to be in consecutive order.
	WALL <first output #> OFF	Turns the wall processing off.
WALLADJ	WALLADJ <first output #>	Adjusts the position of the wall output. This is an interactive command.
WALLSW	WALLSW <input #> <first output #>	Routes an input to the wall outputs.
WALLWINSIZE	WWS <output #> <FIT FILL CENTER STRETCH>	Adjusts the size of the window in wall processing mode.

WINDOWING COMMANDS

(For firmware version 5.62 and above)

Command	Syntax	Action
BORDER	BORDER <output #>	Returns the state of the border and the width.
BORDERCOLOR	BORDERCOLOR <red> <green> <blue>	Returns the value of red, green, and blue for the border.
BORDEROFF	BORDEROFF <output #>	Turns off the border of the magnifying lens.
BORDERON	BORDERON <output #> <width>	Turns on the border if the magnifying lens. <width> is the number of pixels across the lens.
BORDERWIDTH	BORDERWIDTH <output #> <width>	Allows the user to change the width of the border.
CASCADE	CC <display output #>	Causes windows to become equally sized and positioned in an overlapping arrangement that s diagonally across the display. The windows are organized in ascending order by priority. <display output #> is the number of the output displaying the windows.
CIWS	CIWS <output #>	Special command. Saves source window and destination window values into NVRAM.
CLEAREFFECT	CLREFFECT	Clears all effects in memory, including SSO, SDO, WINDOW, WALL, and DISSOLVE.
CLONE	CLONE <window #> <output #>	The specified output mirrors the window output. Control remains at the window output. NOTE: The window and output must be in the same slot.
CROP	CROP <window #>	Interactively crop of the window. Cropping will replace the removed section with background.
	CROP <window #> <left> <top> <right> <bottom> <cropmode>	With multiple arguments, the window is cropped at the specified location and size. <left> and <right> crop in pixels. <top> and <bottom> crop in lines. <cropmode> is 0 or 1: 0= normal, 1=crop
DCWINON	DCWINON <display output #> <start window #> <end window #>	Creates windows in a range, beginning with <start window #> and ending with <end window #>, for up to 36 windows possible.
DUALVIEW	DV <display output #>	Arranges a maximum of 2 windows (with priorities 1 and 2) into dualview formation according to the priorities assigned to them when window function was enabled. <display output #> is the number of the output displaying the windows.
LENSIZE	LENSIZE <output #> <hsize> <vsize>	Adjusts the size of the magnifying lens.

WINDOWING COMMANDS

(For firmware version 5.62 and above)

Command	Syntax	Action
MAGFACTOR	MAGFACTOR <output #> <factor>	Adjusts the magnification factor. By default, <factor> is 2, but can be any number 1-4.
MAGOFF	MAGOFF <output #.	Turns off the magnifying lens feature.
MAGON	MAGON <output #> <fg> <bg>	Turns on the magnifying lens.
PAN	PAN <window #>	Activates controls to pan around the active boundary of zoomed video of the selected window. Control pan action with: i - up, m - down, j - left, l - right q - quit
PIPON	PIPON <display output #> <foreground> <background>	Turns on picture-in-picture windowing mode. <foreground> is the output that will be displayed as a window in the center of the foreground, and <background> is the output that will be displayed in the background, behind this window.
PIPOFF	PIPOFF <display output #>	Turns off picture-in-picture mode. <display output #> is the channel number of the output displaying the windows.
RSTCLONE	RSTCLONE <output #>	Resets the clone on the specified output channel. The output will return to the regular switching mode.
TRIBOTTOM2	TB2 <output #>	Arranges a maximum of 3 windows (with priorities 1, 2, and 3) into TB2 formation according to the priorities assigned to them when window function was enabled. Arranges the first window on the top half of the output and the other 2 windows at the bottom half of the output.
TRIVIEW	TV <display output #>	Arranges a maximum of 3 windows (with priorities 1, 2, and 3) into triview formation according to the priorities assigned to them when window function was enabled. <display output #> is the channel number of the output displaying the windows.
QUADBOTTOM3	QB3 <output #>	Arranges up to 4 windows in QB3 formation: the first window appears on the upper half of the specified output and the other 3 appear at the bottom half of the output.
QUADMAP1	QM1 <quad1> <quad2> <quad3> <quad4>	Special command. <quad 1> - <quad 4> are the outputs feeding to those quadrants. The quadrants are numbered from left to right, top to bottom. Quadrants 1 and 3 will be filled with one input source, and the other 2 will each be filled with different input sources.

WINDOWING COMMANDS

(For firmware version 5.62 and above)

Command	Syntax	Action
QUADMAP2	QM2 <quad1> <quad2> <quad3> <quad4>	Special command. <quad 1> - <quad 4> are the outputs feeding to those quadrants. The quadrants are numbered from left to right, top to bottom. Quadrants 1 and 3 will be filled with one input source, and Quadrants 2 and 4 will be filled with another input source.
QUADSPLIT	QS <display output #>	Sizes each of a maximum of 4 windows to one quarter the size of the output display screen, and arranges them in quad formation according to the priorities assigned to them when window function was enabled. <display output #> is the channel number of the output displaying the windows.
RESETQUADMAP	RSTQM <quad1> <quad2> <quad3> <quad4>	Resets the QUADMAP1 or QUADMAP2 command.
VERTICAL2	V2 <output #>	Arranges the first 2 windows into V2 formation: the window with priority 1 will appear in the top half of the output, and the window with priority 2 will appear in the lower half.
WINDOW	WIN <display output #> <window #> <ON OFF>	Turns the window on or off.
WINDOWIDENTITY	WINID <display output #> <window #>	Identifies the window for the selected output. On the windowing output, the selected window will be on top of other windows and blink for 5 seconds. On the command line, the position and size of the selected window is returned. <display output #> is the channel number of the output displaying the windows.
WINDOWPOSITION	WINPOS <window #>	Controls the positioning and size of the output under windowing mode. This is an interactive command.
	WINPOS <window #> <hpos> <vpos> <hsize> <vsize>	Controls the positioning and size of the output under windowing mode. With this command, the window is positioned at the specified coordinate and size. <hpos> and <vpos> refer to the upper left corner of the window. <hsize> is in pixels; <vsize> is in lines.

WINDOWING COMMANDS

(For firmware version 5.62 and above)

Command	Syntax	Action
	WINPOS <window #> <zi zo ml mr mu md stop> <speed>	Controls the positioning and size of the output under windowing mode. Run the command in background mode. This command will run until it reaches the limit or receives a stop instruction. zi = zoom in, zo = zoom out, ml = move left, mr = move right, mu = move up, md = move down, stop= stop the process. Speed is 1 to 10.
	WINPOS <window #> <LA RA TA BA CA>	Aligns the output under windowing mode. LA= left align, RA= right align, TA= top align, BA= bottom align, CA= center align.
WINDOWPRIORITY	WINPRI <display output #> <window #> <priority>	Changes the priority of the output.
WINFS	WINFS <display output #> <window #>	Expands the selected window to fill the entire display screen.
WINON	WINON <display output #> <window #> <window #> <window #> <window #>	Turns the windowing function ON. <display output #> is the channel number of the output displaying the windows. - User can select different configurations of windows, with a maximum of 4 windows possible. - The sequence of the <window #> entries determines the initial priority of those windows. - EXAMPLE: If outputs 6, 7, and 8 display at output 5 as windows, with Window 8 at the highest priority, the command will be: WINON 5 8 6 7.
WINOFF	WINOFF <display output #>	Turns the windowing function OFF. <display output #> is the number of the output displaying the windows.
WINDOWZOOM	WINZM <window #>	Zooms/pans the content inside the window. This is an interactive command.
ZOOM	ZOOM <window #>	Activates zoom control for the selected window. This is an interactive command. Control zoom action with: <+> zoom in <-> zoom out NOTE: Using the ZOOM command's zoom controls when under windowing mode will size the window up or down. Use the WINZM command to zoom within a selected window.

WINDOWING COMMANDS
(For firmware version 5.62 and above)

Command	Syntax	Action
	ZOOM <window #> <action> <speed>	This type of pan and zoom is meant for use with a programmable external control device. Run the command in background mode. This command will run until it reaches the limit or receives a stop instruction. <window #> is the number (1-36) of the output channel connected to the window you want to control. <action> is one of the following: zi- zoom in (size up), zo- zoom out (size down), pu- pan up, pd- pan down, pl- pan left, pr- pan right, STOP. <speed> is a value from 1 - 10 and sets the speed of the action. NOTE: Using the ZOOM command's zoom controls when under windowing mode will size the window up or down. Use the continuous WINPOS command to zoom within a selected window.

USING AN EXTERNAL CONTROLLER

For a more robust communications protocol, the CXPS supports external controllers, such as Crestron or AMX devices. Black Diamond Video has developed a special control protocol which will enable most control applications. This protocol is enabled and disabled with the command EXTCTL <ON|OFF>.

Once the protocol is enabled, all commands sent to the CXPS are echoed back to the controller. The feedback from the CXPS is structured as follows:

STX(0x02) [command in upper case] [result] ETX(0x03)

EXAMPLE

With a DVI signal connected to input 3, you want to know if input 3 has a valid signal. You use the INSTATUS 3 command. As a valid signal is present, the result is 1.

The ascii code issued from the controller for this example is:

0x69 0x6E 0x73 0x74 0x61 0x74 0x75 0x73 0x20 0x33 0x0A 0x0D

The CXPS echoes back the command in upper case together with the result, and bracketed by the start and end transmission codes:

0x02 0x49 0x4E 0x53 0x54 0x41 0x54 0x55 0x53 0x20 0x33 0x20
0x31 0x0A 0x0D 0x03

Continuous Pan & Zoom

CONTINUOUS PANNING AND ZOOMING AN OUTPUT DISPLAY

This type of pan and zoom is meant for use with a programmable external control device. The continuous pan and zoom controls let you continue an action until the STOP command is issued.

The command is:

ZOOM <output #> <action> <speed>

Where:

- <output #> is the number of the output channel connected to the output display or window you want to control.
- <action> represents the type of pan or zoom:

Action	Description
ZI	Zoom in
ZO	Zoom out
PL	Pan left
PR	Pan right
PU	Pan up
PD	Pan down
STOP	Stop action

- <speed> is a value from 1 - 10 and sets the speed of the action.

CONTINUOUS PANNING AND ZOOMING A WINDOW

This type of command is meant for use with a programmable external control device. The continuous pan and size controls let you continue an action until the STOP command is issued.

NOTE: Using the ZOOM command to zoom in or out will adjust the window's size. To zoom in or out *within* a window, use the continuous WINPOS command described in the section "Continuous Window Position & Zoom" on page 116. Once the window is large enough to completely fill the display screen, the pan controls may be used to pan within the window.

The command is:

ZOOM <window #> <action> <speed>



Where:

- `<window #>` is the number of the output channel connected to the window you want to control.
- `<action>` represents the type of pan or zoom.

Remember: zooming in or out of a window using the ZOOM command will adjust the window's size.

Action	Description
ZI	Zoom in (sizes window up)
ZO	Zoom out (sizes window down)
PL	Pan left
PR	Pan right
PU	Pan up
PD	Pan down
STOP	Stop action

- `<speed>` is a value from 1 - 10 and sets the speed of the action.

Continuous Window Position & Zoom

This type of window position and zoom command is meant for use with a programmable external control device. The continuous window position and zoom controls let you continue an action until the STOP command is issued.

The command is:

WINPOS `<window #>` `<zi | zo | ml | mr | mu | md | stop>` `<speed>`

Where:

- `zi` = zoom in
- `zo` = zoom out
- `ml` = move window left
- `mr` = move window right
- `mu` = move window up
- `md` = move window down
- `<speed>` is a value from 1 - 10 and sets the speed of the action.

RS-232 PINOUT

The RS-232 connector on the CXPS uses the pinout configuration as shown in *Figure 25*.

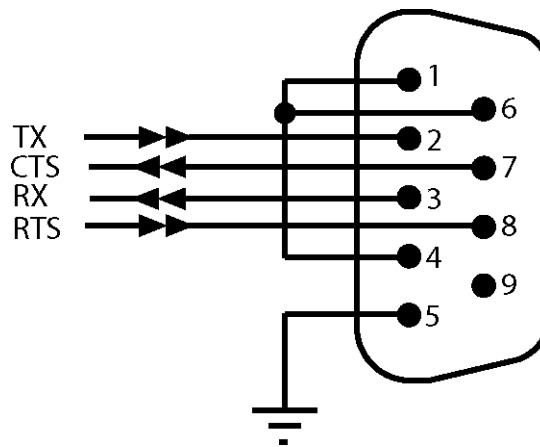


FIGURE 25. CXPS RS-232 Pinout



RS-232 AND 10/100T PROTOCOL

RS-232 Pinout

UPGRADING FIRMWARE

As a hardware device, the CXPS contains firmware. Firmware is embedded software that provides the necessary machine instructions for how the device operates. From time to time, Black Diamond Video publishes firmware updates. These updates may add functionality to or improve the operational efficiency of the CXPS.

Firmware updates, as they become available, are accessible from the Support page of the Black Diamond Video web site (www.blackdiamondvideo.com). You may also receive a firmware upgrade on a CD.

Firmware upgrades are performed using a 10/100T Ethernet connection, and, optionally, RS-232 control.

Download or Copy Firmware Upgrade to the Control Computer

The first step in performing a firmware upgrade for your CXPS is to acquire the update file and store it to a location on the Ethernet control computer. Firmware updates may be downloaded from the Black Diamond Video web site or provided to you on a CD.

- 1 **On the Ethernet control computer, create a folder to store the firmware upgrade.**

For this example, we'll create the folder on the Local Disk (C:) and name it `upgrade`.

NOTE: You may save the upgrade file to any drive you wish and use any folder name you like.

- 2 **Download the firmware upgrade file from a CD or from the Black Diamond Video web-site into the folder created in Step 1.**

The file name is **`bdvcxps.bin.xxx`**, where **`.xxx`** is the firmware version number. You are now ready to upgrade the firmware of the CXPS.

Upgrade the CXPS Firmware

The upgrade can be accomplished entirely through Ethernet control, or you can use RS-232 control to issue the final upgrade command.

- 1 **Open the Command Prompt on the Ethernet control computer.**
- 2 **Change the directory to the directory (folder) into which the firmware upgrade was downloaded during the task "Download or Copy Firmware Upgrade to the Control Computer." In our example, this is done by entering the command: `cd\upgrade`. The new command prompt is `C:\upgrade>`.**
- 3 **Type the command: `ftp`**

UPGRADING FIRMWARE

- 4 **Open the 10/100T Network Connection between the control computer and the FTP Server within the CXPS by typing in the commands:**

open <ip address>

User: bdv

Password: blackdiamond

A prompt sign appears: >

NOTE: If the IP address is not known, establish RS-232 control of the CXPS and issue the SHOWNET command. This returns the IP address of the device.

- 5 **To switch to binary mode, type the command: bin**

A command prompt appears again: >

- 6 **Type the command: put <filename>, where the file name is the name of the file you downloaded in Step 2 of "Download or Copy Firmware Upgrade to the Control Computer."**

In our example, the command is: put bdvcxps.bin.xxx

- 7 **Close the connection to the CXPS ftp server by typing the command: quit**

The connection to the CXPS ftp server is closed.

- 8 **Open a Telnet session with the CXPS by typing the command: telnet <ipaddr> 8998**

The Telnet session is initiated.

- 9 **Enter the network password.**

The default password is "blackdiamond".

- 10 **Issue the upgrade firmware command in one of two ways:**

- a From the serial port terminal, issue the RS-232 command: ufw

Progress information about the upgrade process appears on the terminal.

- b From the Ethernet connection Command Prompt, type in the command: ufw

- 11 **The upgrade process takes approximately 2 - 3 minutes. When the upgrade is done, you are instructed to power cycle the CXPS.**

- 12 **Type the command: rfd**

Once you have issued this command, the firmware upgrade is complete, unless you are using firmware version 4.85 or previous.

- 13 **If you are using firmware version 4.85 or previous, type the command: rstoutputattr**

Once you have issued this command, the firmware upgrade is complete.